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# **NORTHERN**

Utilization Research & Development Division

## **Publications and Patents**

**January - June 1967**

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Northern Utilization Research and Development Division  
Agricultural Research Service  
United States Department of Agriculture  
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## INTRODUCTION

The Congress in 1938 authorized four regional laboratories, now known as Utilization Research and Development Divisions, to conduct basic and applied research designed to expand, improve, and develop through science and technology the utilization of American farm crops. The need and importance of such research arise because the farmer is not organized to carry on modern scientific research to maintain old markets for his products and to create new ones. Since their inauguration, these laboratories have contributed much basic knowledge of the chemical composition and physical properties of farm commodities and have applied this knowledge to create new or improved products and processing technology that have enhanced utilization of many farm commodities.

The Northern Utilization Research and Development Division is responsible for research on industrial utilization of the cereal grains--corn, wheat, barley, grain sorghum, and oats; and the oilseeds--soybeans and flaxseed. Except for

wheat and barley, the research includes food and feed uses of these crops. In the Department's program of research on replacement crops, the Northern Division conducts all screening and characterization studies on uncultivated plants and their components. It is also responsible for more intensive research on new oilseeds containing erucic acid and on new gum and pulp fiber plants. In addition to its internal program of research, it carries out work through domestic contracts and grants and conducts related research abroad under grants or contracts involving Public Law 480 funds.

The research investigations at the Northern Division are supported by more than 400 people, about one-half of whom have professional status. This body of highly trained men and women with specialized knowledge in various disciplines are responsible for the scientific publications and patents listed here.

## REQUEST FOR INFORMATION

The results of the research of the Northern Utilization Research and Development Division are published regularly in the technical literature, and public-service patents are secured to cover patentable inventions and discoveries (see page 43). As a convenient guide to our publications and patents, a list with abstracts is published semi-annually. The abstracts describe the current research and indicate the progress achieved. Further information on any of the developments, as well as earlier technical papers, may be obtained by writing us.

In conformance with the policy of the Department of Agriculture, Northern Division publications are available to scientists and other specialists, librarians, representatives of the press, and others interested.

Requests for specific reprints should be by number and addressed to the Northern Division. Those titles marked with an asterisk [\*] are not available for distribution.

Most of the publications are in journals that are available in libraries. Photographic copies of most journal articles on research at this Division can be purchased from the National Agricultural Library of the U.S. Department of Agriculture, Washington, D.C. 20250.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with the Director of the National Agricultural Library.

Copies of previous lists of publications and patents are available upon request.

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## PUBLICATIONS

[Publications marked (\*) are not available for distribution. When requesting reprints, order by number.]

### 2107 • **Crambe. A Progress Report**

GEORGE A. WHITE<sup>1</sup> and IVAN A. WOLFF

(<sup>1</sup>USDA Crops Research Div., Beltsville, Md.)

Crops Soils Mag. 19(4): 16. January 1967

The latest information on the new oilseed crop, crambe, relating to 1966 plantings, growing practices,

processing, feed uses, new markets, and who should grow it.

### 2111 • **Advances in Research on the Use of Soybean Oil**

J. C. COWAN

Proc. 1965 Cottonseed Processing Clinic, held at New Orleans, La.,

February 8-9, 1965

South. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., ARS-72-49, pp. 58-65. October 1966

A review of important factors and recent developments in the flavor stability of soybean oil includes: Metallic impurities and their inactivation; linolenate, a source of flavors; lower levels of linolenate and

tocopherol; and better protection against air and light. Recent work on aldehyde oils and their use are also covered.

### 2112 • **The Fermentative Capacity of Microbial Cells**

R. A. RHODES

Chem. Eng. Progr., Symp. Ser. 62(69): 21-29. 1966

Microbial cells fermentatively bring about more than 1,300 single-stage transformations of extra-cellular substrate to particular recoverable product. Such cellular activities are regulated by both metabolic (permease, feedback) and genetic (enzyme

induction-repression) control mechanisms. The genetic apparatus of cells is the basis of both types of control mechanisms and can be altered by mutation or by recombination to modify the properties of cells directly and permanently.

**2113 • Publications and Patents from Research on New Crops by Utilization Research and Development Divisions, 1965**

North. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., CA-71-30-1, 12 pp. January 1967 [Processed]

**2114 • Alcohol-Insoluble Proteins of Cereal Grains**

R. J. DIMLER

Fed. Proc. 25(6): 1670-1675. November-December 1966

The alcohol-insoluble fraction, or gluelin, is a significant part of cereal grain proteins. The methods of isolating this fraction leave much to be desired, both because of the difficulty of getting complete extraction and because of the considerable chance for chemical modification during extraction and isolation. From the standpoint of nutrition, the alcohol-insoluble fraction generally is superior to the alcohol-

soluble fraction in terms of those amino acids deficient or limiting in corn. Relative to molecular structure, the glutelin is predominantly a high-molecular-weight protein in which protein or polypeptide units are held together by disulfide linkages. These units may or may not be chemically related to the component proteins of other fractions, such as prolamine and globulin.

**2115 • An Immunological Study of Wheat Gluten Proteins and Derivatives**

A. C. BECKWITH and D. C. HEINER<sup>1</sup>

(<sup>1</sup>University of Utah College of Medicine, Salt Lake City)

Arch. Biochem. Biophys. 117(2): 239-247. November 1966

Sera from subjects with proven gliadin-induced celiac disease were used to make immunological comparisons of wheat gluten, glutenin, gliadin, gliadin derivatives, and gliadin components. The antigenic behavior of gliadin proteins was closely associated with their native structure. Although for a single antigen, Gli I, a precise folding of the protein chains may not be essential for activity, the random coil

form of the antigen is inactive. In addition, antigenicity is influenced by the type of polar end-groups on aspartic and glutamic acid residues in gliadin. The Gli I antigen, which commonly elicits a precipitin response in subjects with gluten-induced celiac disease but rarely does so in other subjects, was also closely associated with certain gliadin components.

**2116 • Some Properties of Hydroxypropylated Amylomaize Starch Films**

W. B. ROTH and C. L. MEHLTRETTER

Food Technol. 21(1): 72-74. January 1967

Water-soluble, transparent films were produced from a hydroxypropylated (1.1%) amylomaize starch. Oxygen transmission of the plasticized (5% glycerol) and unplasticized films was not detectable at 5° and 25° C. in a wide relative humidity (RH) range. Partial etherification thus does not change the oxygen barrier properties of amylomaize starch. Tensile

properties of the films measured at 50% RH and 25° C. showed that hydroxypropylation reduced dry tensile strength of amylomaize starch film but increased elongation and bursting strength. Tensile strength was harmed by increase in RH, but elongation was improved.



**2117 • Facile Route to Sugar Thionocarbonates**

B. S. SHASHA, W. M. DOANE, C. R. RUSSELL, and C. E. RIST  
Carbohydr. Res. 3(1): 121-123. November 1966

A novel method is described for converting vicinal *cis*- and *trans*-diol groups in sugars into the corresponding cyclic thionocarbonates. Conversion is ac-

complished via the bis(*O*-thiocarbonyl) disulfide group as the intermediate.

**2118 • Aflatoxin B<sub>1</sub> Uptake by *Flavobacterium aurantiacum* and Resulting Toxic Effects**

E. B. LILLEHOJ, A. CIEGLER, and H. H. HALL  
J. Bacteriol. 93(1): 464-471. January 1967

Removal of aflatoxin B<sub>1</sub> from liquid cultures by resting and growing cells of *Flavobacterium aurantiacum* NRRL B-184 was studied. Spectrophotometric and thin-layer techniques served as aflatoxin assays. Cells grown in the presence of 5 p.p.m. or higher levels of aflatoxin developed aberrant morphological forms. These toxin concentrations partially inhibited growth, and the nature of the inhibition suggested that aflatoxin interfered with cell wall synthesis. Incubation of  $1.0 \times 10^{11}$  resting cells per milliliter with 7.0  $\mu\text{g./ml.}$  of aflatoxin B<sub>1</sub> during a 4-hour

period facilitated complete toxin removal from a buffered aqueous medium. Autoclaved cells and cell wall preparations could remove a fraction of the aflatoxin of a test system. Although this fraction could be extracted by washing with water, the aflatoxin B<sub>1</sub> removed by intact cells could not be extracted into the liquid phase. The uptake of aflatoxin B<sub>1</sub> by resting cells was sensitive to temperature and pH. Ruptured preparations of *F. aurantiacum* were not able to remove or modify the aflatoxin in an aqueous solution.

**2119 • Fraction and Characterization of Alcohol Extractables Associated with Soybean Proteins. Nonprotein Components**

A. M. NASH, A. C. ELDRIDGE, and W. J. WOLF  
J. Agr. Food Chem. 15(1): 102-108. January-February 1967

Isolated soybean proteins extracted with 86% (v/v.) ethanol yielded 3.7% of a light brown semisolid. The alcohol-extractable materials were fractionated by chromatography on diethylaminoethyl cellulose columns with nonaqueous solvents and preparative thin-layer chromatography on silicic acid.

Phosphatidyl choline, phosphatidyl ethanolamine, saponins, sitosterol glycoside, and genistein were identified. About one-fourth of the alcohol extract was a yellow oil containing triglycerides and other neutral compounds.

**2120 • Acetalization of Aldehyde Oils by Catalysis with Cation-Exchange Resins**

R. E. BEAL, D. E. ANDERS, and L. T. BLACK

J. Amer. Oil Chem. Soc. 44(1): 55-58. January 1967

Aldehyde oils produced on a pilot-plant scale gradually polymerized at room temperature and became extremely viscous or solidified in a few weeks. Initial viscosity level was maintained by converting the oils to acetals by using a strong cation resin catalyst that does not cause appreciable transesterifi-

cation. Aldehyde conversion was determined by infrared absorbance at  $2720\text{ cm}^{-1}$ . Effects of the amount of alcohol and resin on the degree of conversion were studied. Storage studies indicated that the acetal oils must be protected from oxidation.

**2121 • Production of Aflatoxin on Wheat and Oats: Measurement with a Recording Densitometer**

R. D. STUBBLEFIELD, O. L. SHOTWELL, C. W. HESSELTINE, M. L. SMITH, and H. H. HALL

Appl. Microbiol. 15(1): 186-190. January 1967

A method was developed to produce aflatoxin by growing *Aspergillus flavus* strain NRRL 3145 on solid substrate wheat. Optimum yields of 900  $\mu\text{g}$ . aflatoxin  $G_1$  and 900  $\mu\text{g}$ . aflatoxin  $B_1$  per gram of substrate were obtained in 4 to 5 days at  $28^\circ\text{C}$ . A study of aflatoxin production on hulls and groats of oats and on whole oats by *A. flavus* strains NRRL 2999, NRRL 3000, and NRRL 3145 revealed that aflatoxin was produced on all three substrates, al-

though production was very slight on hulls. Strain NRRL 3145 grown on solid substrate groats gave the largest amounts of aflatoxin: 580  $\mu\text{g}$ .  $B_1$  and 450  $\mu\text{g}$ .  $G_1$  per gram of substrate. The densitometric method described for reading thin-layer chromatoplates is more objective and more accurate than the visual methods previously used to determine all four aflatoxins.

**2122 • Conjugation of Soybean Oil by Decomposition of Its Iron Tricarbonyl Complex with Carbon Monoxide**

E. N. FRANKEL and S. METLIN<sup>1</sup>

(<sup>1</sup>Pittsburgh Coal Research Center, Pittsburgh, Pa.)

J. Amer. Oil Chem. Soc. 44(1): 37-39. January 1967

Soybean and other vegetable oils are conjugated by decomposing their iron tricarbonyl complexes with carbon monoxide at elevated pressures. This procedure converts the iron tricarbonyl moiety of the complex into iron pentacarbonyl, which is recovered and reused. When iron carbonyl-complexed soybean oil is heated at  $180^\circ$  to  $200^\circ\text{C}$ . at CO pressures of 1,090 to 3,750 p.s.i., from 90 to 97% of the complex

is decomposed into  $\text{Fe}(\text{CO})_5$  and conjugated soybean oil. At  $180^\circ\text{C}$ . and 3,600 p.s.i. CO, 84% of the  $\text{Fe}(\text{CO})_5$  is recovered, and 82% of the polyunsaturates in the oil is conjugated. At  $200^\circ\text{C}$ . and 1,090 p.s.i. CO, 98% of the  $\text{Fe}(\text{CO})_5$  is recovered, but the oil is less conjugated (75%). These studies point the way to a possible process for conjugating vegetable oils by consecutive reactions with  $\text{Fe}(\text{CO})_5$  and CO.



**2123 • Countercurrent Distribution of Alkali-Isomerized Methyl Linolenate with an Argentation System**

C. R. SCHOLFIELD, R. O. BUTTERFIELD, HELEN PETERS,  
C. A. GLASS, and H. J. DUTTON

J. Amer. Oil Chem. Soc. 44(1): 50-54. January 1967

The isomerized product from heating linolenic acid with potassium hydroxide in ethylene glycol at 165° C. for 30 minutes was separated into urea-adduct-forming (AF) and nonurea-adduct-forming (NAF) materials. Both were converted to methyl esters and fractionated by countercurrent distribution (CCD) between hexane and 0.2 N silver nitrate in 90% methanol. Some of the CCD fractions were fur-

ther fractionated by low-temperature crystallization from acetone.

The AF material was largely trienoate, containing triene conjugation, and trienoate, containing diene conjugation. The NAF material consisted of the same two components plus cyclic esters.

**2124 • Quantitative Isolation and Dispersion of Starch from Corn Kernels Without Degradation**

JAMES P. MCGUIRE and STIG R. ERLANDER

Die Stärke 18(11): 342-346. November 1966

A method has been developed to isolate starch quantitatively from corn kernels and possibly from other plant products. The solubilized starch isolated by this method is not degraded or hydrolyzed. Consequently, the method provides a means for determining the correct physical and chemical properties of quantitatively isolated starch. Briefly, the method involves soaking the kernels overnight at 35° C., chopping the kernels in a homogenizer in the presence

of sufficient water, treating the isolated product with a proteolytic enzyme, and dispersing the centrifuged product with 90% dimethyl sulfoxide. The yield of starch is within 1% of that by the calcium chloride method. Optical rotation is used to determine the concentration of starch in our method. If desired, the amylose and amylopectin can be separated from each other conventionally.

**2125 • Toxic Butenolide Produced by *Fusarium nivale* (Fries) Cesati Isolated from Tall Fescue (*Festuca arundinacea* Schreb.)**

S. G. YATES, H. L. TOOKEY, J. J. ELLIS, and H. J. BURKHARDT<sup>1</sup>

(<sup>1</sup>West. Util. Res. Develop. Div., Albany, Calif.)

Tetrahedron Lett. (7): 621-625. February 1967

A toxic metabolite has been isolated from a culture of *Fusarium nivale*, a mold found on tall fescue from a pasture where fescue toxicity had been reported. The toxin has been characterized as 4-

acetamido-4-hydroxy-2-butenic acid- $\gamma$ -lactone. The relationship of this compound to the cause of fescue foot in cattle is currently under study.



**2126 • Effect of Ionic Strength on the Molecular Weight and Conformation of Wheat Gluten Proteins in 3 M Urea Solutions**

Y. VICTOR WU, JAMES E. CLUSKEY, and KENNETH R. SEXSON  
 Biochim. Biophys. Acta 133(1): 83-90. January 1967

Optical rotatory dispersion, intrinsic viscosities, and sedimentation coefficients of wheat gluten, glutenin, and gliadin in 3 M urea plus KCl solutions were studied at various ionic strengths. There appears to be an increase of  $-b_0$  values with ionic strength for glutenin and a resulting increase in helix content. No trend is observed for gliadin. The intrinsic viscosities of glutenin and gliadin increase with decreasing ionic strengths, and a much larger increase is shown with

glutenin. There is no change in sedimentation coefficient for glutenin and gliadin as the ionic strength varies. Both proteins appear to be a mixture of  $\alpha$ -helix and random coil. Evidently gliadin contains more  $\alpha$ -helix than glutenin, and a relatively compact structure of gliadin is suggested by its lower intrinsic viscosity and its lower sensitivity to changes in ionic strengths.

**2127 • The Nuclear Cycle in Protosexual Yeasts**

LYNFERD J. WICKERHAM

Mycologia 58(6): 943-948. November-December 1966

Electron micrography has demonstrated that the bisexual forms of species of *Chlamydozoma* have a single nucleus. Thus segregation of chromosomes may occur at haploidization when the bisexuals produce unisexual offspring. Dr. El-Ani's contention that the protosexual yeasts are basically ascosporeogenous is

refuted because (1) the entire sexual cycle occurs in the laboratory, but ascospores are never observed and (2) if genes for blocking of ascospores existed in these species, the entire cycle could not take place in the laboratory.

**2128 • An Economic Evaluation of Starch Use in the Textile Industry**

CLARENCE A. MOORE

(USDA Econ. Res. Serv., Peoria, Ill.)

U.S. Econ. Res. Serv., Agr. Econ. Rep. 109, 35 pp. March 1967

Starch apparently has a firm economic advantage over chemical resins for sizing. Recovery and reuse of chemical resins may be a future threat but at present too costly. Increasingly, chemicals must be "tailor-made" for more specialized tasks in textile sizing, printing, and finishing. The growing number of different fibers, yarn counts, blends, and fabrics

tends to ensure, for example, that a sizing agent which performs well for one yarn will not do so for others. Consequently, starch's competitive position will be maintained or improved only by industry providing modified and starch-derived products applicable for sizing the wide variety of yarns and fabrics being woven. Technology is the key to its potential.

**2129 • Trehalose and Acyclic Polyols in Sclerotia of *Sclerotinia sclerotiorum***

DUANE LeTOURNEAU

Mycologia 58(6): 934-942. November-December 1966

The nonreducing disaccharide- $\alpha,\alpha$ -D-trehalose- and the acyclic polyols-D-mannitol, D-arabitol, and glycerol-were isolated from sclerotia of *Sclerotinia sclerotiorum* obtained from a commercial pea cleaning operation. In addition, small amounts of glucose, fructose, and mannose, as well as at least one other polyol, probably erythritol, were detected in alcohol extracts of such sclerotia. Trehalose and the three

polyols made up 10 to 12% of the dry weight of sclerotia from pea and bean cleaning operations. Trehalose and mannitol were the two major alcohol-soluble carbohydrates of sclerotia grown on potato-dextrose and glucose-salts agar media. Trehalose and mannitol constituted 6 to 7% of sclerotia grown on glucose-salts agar.

**2130 • Ion-Exchange Separation and Quantitative Determination of Dimethyl Sulfoxide**

L. H. KRULL and MENDEL FRIEDMAN

J. Chromatogr. 26(1): 336-338. January 1967

A general ion-exchange procedure was developed that permits removal and quantitative estimation of dimethyl sulfoxide (DMSO) from reaction media that contain acidic, neutral, and basic compounds, where DMSO is present in solvent quantities. This procedure was applied to DMSO solutions of a variety

of structurally different compounds and should be readily adaptable to the separation of other non-protonic solvents, such as dimethylformamide and dioxane, from compounds which bind to ion-exchange resins.

**2131 • Mechanism of Lipoxidase Reaction. II. Origin of the Oxygen Incorporated into Linoleate Hydroperoxide**

AMI DOLEV, W. K. ROHWEDDER, T. L. MOUNTS, and H. J. DUTTON

Lipids 2(1): 33-36. January 1967

Two different series of experiments were performed to establish the origin of the oxygen molecule incorporated into hydroperoxide during incubation of lipoxidase with linoleic acid. These showed, as previously assumed but never demonstrated, that the oxygen introduced into the hydroperoxide mole-

cules comes from the gaseous phase and not from the aqueous phase. Furthermore, soybean lipoxidase does not catalyze the exchange between gaseous oxygen and water oxygen. Possibly, lipoxidase may be involved in the biosynthesis of hydroxy *trans,cis*-conjugated octadecadienoates present in various seeds.

**2132 • Mechanism of Lipoxidase Reaction. I. Specificity of Hydroperoxidation of Linoleic Acid**

AMI DOLEV, W. K. ROHWEDDER, and H. J. DUTTON  
Lipids 2(1): 28-32. January 1967

Linoleate hydroperoxides from autoxidation of methyl linoleate are compared with those from lipoxidase oxidation of linoleic acid. Data indicate an equal amount of methyl 9- and 13-hydroperoxy-octadecadienoate produced by autoxidation of methyl

linoleate, and the exclusive formation of 13-hydroperoxyoctadeca-9,11-dienoic acid from the incubation of lipoxidase with linoleic acid. From these findings, a specific mechanism for the reaction of lipoxidase with linoleic acid is postulated.

**2133 • (S)-3-Hydroxypent-4-enethionamide: A New Reaction Product of a Natural Thioglucoside**

F. L. AUSTIN AND C. A. GENT  
Chem. Commun. (2): 71-72. January 1967

*epi*-Progoitrin in aqueous solution undergoes degradation without enzyme in the presence of ferrous ion to produce a mixture of (*S*)-1-cyano-2-hydroxy-3-

butene and (*S*)-3-hydroxy-4-pentenethionamide. The physical properties of the thionamide and its transformation into the unsaturated nitrile are described.

**2134 • Microreactor for Methanolysis of Triglycerides before Gas-Liquid Chromatography**

V. L. DAVISON and H. J. DUTTON  
J. Lipid Res. 8(2): 147-149. March 1967

A rapid, accurate microprocedure has been developed for gas chromatographic determination of the fatty acid composition of small (2-3  $\mu$ l.) samples of vegetable oils. This microtechnique combines

transesterification and sample injection into a single operation. The fatty acid compositions of soybean, linseed, and safflower oils thus determined are compared with those from the usual two-step procedure.

**2135 • 2,3-Thionocarbonate and 2,3-Carbonate Derivatives of D-Glucopyranosides**

E. I. STOUT, W. M. DOANE, B. S. SHASHA, C. R. RUSSELL, and C. E. RIST  
Carbohydr. Res. 3(3): 354-360. January 1967

A unique sugar derivative, methyl 4,6-*O*-benzylidene- $\alpha$ -D-glucopyranoside 2,3-thionocarbonate containing a *trans*-fused ring-structure, was prepared in good yield by rearrangement of bis(methyl 4,6-*O*-benzylidene-2-*O*-thiocarbonyl- $\alpha$ -D-glucopyranoside) disulfide. This thionocarbonate was converted into the novel methyl 4,6-*O*-benzylidene- $\alpha$ -D-glucopyranoside 2,3-carbonate in 93% yield on treatment with

silver nitrate. By following the same reaction sequence, 2,3-thionocarbonate and 2,3-carbonate groups were introduced into 6-*O*-tritylamylose. Rearrangement of bis(*O*-thiocarbonyl) disulfide derivatives provides a new route for the synthesis of carbohydrate thionocarbonates and carbonates previously unavailable.



**2136 • Separation and Analysis of Some *cis,trans* Isomeric Olefins on Activated Alumina**

G. R. LIST, R. L. HOFFMANN, and C. D. EVANS

Nature 213(5074): 380-381. January 28, 1967

A series of C<sub>4</sub>-C<sub>8</sub> *cis,trans* isomeric olefins were separated by gas-solid chromatography on activated alumina. Data are presented showing that mixtures of

*cis,trans*-2-butenes may be quantitatively analyzed by the method described, and an explanation of *cis,trans* elution order is provided.

**2137 • One-Shot Rigid Urethane Foam from Starch-Derived Polyethers**

F. H. OTEY, FLORENCE L. BENNETT, BONNIE L. ZAGOREN, and C. L. MEHLTRETTER

J. Cell. Plast. 3(3): 138-143. March 1967

One-shot rigid urethane foam with more than 90% closed cells was prepared from polyethers, obtained by reacting starch and ethylene glycol and then propoxylating. Crosslinking the low-cost polyether mixture with either polymeric isocyanate or crude toluene diisocyanate (TDI) yields foams comparable to those now on the market. Foam based on the polymeric

isocyanate required 0.6% phosphorus to become self-extinguishing, whereas that based on crude TDI needed 1.2%. Also determined were effects of adding a fire retardant and of varying the polyether hydroxyl number in the formulation on dimensional stability and strength of the foam.

**2138 • New Crops. A List of Publications for 1966**

North. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., ARS-71-19-5, 4 pp. April 1967 [Processed]

**2139 • Antimicrobial Activity of Propolis**

LLOYD A. LINDENFELSER

Amer. Bee J. 107(3): 90-92. March 1967; 107(4): 130-131. April 1967

Propolis, a resinous material gathered and stored by honeybees from the buds of plants, was tested for its *in vitro* activity against a wide variety of microorganisms. Fifteen specimens from various parts of continental U.S.A., six of which were collected from the same apiary over a period of time, were used in the experiments. Employed as test organisms were 39 bacteria, 2 yeasts, and 39 molds, including phytopathogens, saprophytic species, and one insect pathogen. The active factors of the 15 samples were also compared by paper strip chromatography.

The majority of the specimens demonstrated both antifungal and antibacterial activity, but none were active against the yeasts. At concentrations of less than 100 µg./ml., 25 of the 39 bacterial strains and 20 of the 39 fungal cultures were inhibited. Most sensitive of the bacteria were the gram-positive and acid-fast groups. Among those inhibited were 16 phytopathogens and 1 insect pathogen. Results indicate that the active agents in all the specimens were identical, varying only in the quantity present in the individual samples.

**2140 • A Stream Splitter and Functional Group Tester for Use with a Flame Ionization Detector**

R. L. HOFFMANN and C. D. EVANS

J. Chromatogr. 26(2): 491-494. February 1967

A stream splitter has been devised that permits either fraction collection or functional group analysis of the effluent from a gas chromatograph equipped with a flame ionization detector. Column effluent is

divided by ordinary hypodermic needles. The unit is easily constructed of inexpensive materials and can be adapted to a variety of gas chromatographs.

**2141 • Micro Vapor-Phase Hydrogenation Monitored with Tandem Chromatography-Radioactivity. II. Evaluation of Catalyst Selectivity for Linolenate**

T. L. MOUNTS and H. J. DUTTON

J. Amer. Oil Chem. Soc. 44(2): 67-70. February 1967

Micro vapor-phase hydrogenation is a rapid and effective method of studying the kinetic characteristics of hydrogenation catalysts. Eight catalysts were investigated, and their reaction rates and selectivity

ratios determined by an analog computer. Fatty esters labeled with  $C^{14}$  were utilized to clarify reactions and to assist in achieving a unique simulation of the data for a particular catalyst.

**2142 • Potential Synthetic Lubricants: Diol Ester of  $C_{18}$ -Saturated Cyclic Acids**

J. P. FRIEDRICH and L. E. GAST

J. Amer. Oil Chem. Soc. 44(2): 110-112. February 1967

Monoalkyl esters of linseed oil-derived  $C_{18}$ -saturated cyclic acids (HCal), described in earlier work, showed promise as lubricant base stocks for turbine aircraft as set forth in military specification MIL-L-7808E. These esters, however, did not exhibit the increased oxidative stability and higher viscosity required by the latest specification MIL-L-23699.

Six diol esters of HCal have now been prepared. Both hindered and unhindered dihydric alcohols were used, including ethylene glycol, 1,4-cyclohexanedimethanol, 1,4-benzenedimethanol, 2,3-dimethyl-1,3-propanediol, and 2,2,4,4-tetramethyl-1,3-cyclobutanediol (I). Viscosities of these esters at 210° F.

ranged from 10.1 to 19.6 centistokes, and pour points, from -35° to -62° F. Oxidative stabilities at 400° F. were determined with 0.5% each of phenyl- $\alpha$ -naphthylamine (PANA) and *p,p'*-dioctyldiphenylamine as inhibitors. Esters of the unhindered diols had poor stability, whereas esters of the hindered diols, particularly I, resisted formation of acidic decomposition products and sludge. Although the HCal ester of I by itself is too viscous to meet specification MIL-L-23699, its ASTM slope (0.650) is excellent. Blends of this material with less viscous hindered esters, commercially available, may find application as lubricants for high-performance turbine engines used in various aircraft.

**2143 • Oxazoline Polyester Coating Resins**

W. J. DeJARLAIS, L. E. GAST, and J. C. COWAN  
 J. Amer. Oil Chem. Soc. 44(2): 126-128. February 1967

Oxazoline polyester resins were prepared by reaction of oxazoline diols from linseed acids and tris(hydroxymethyl)aminomethane with each of five dibasic acids (adipic, dimer, fumaric, itaconic, and maleic). Certain resins were dissolved in isopropyl alcohol to give solutions infinitely water dilutable when the free carboxyl was neutralized with an amine. Film properties of resins cast on steel plates were

investigated. Drying characteristics, hardness, color stability, and solvent resistance of some of these films equaled or excelled those of a commercial soy alkyd resin, although their initial color was darker. The resins prepared from itaconic and maleic acids have potential value as water-solubilizable coating vehicles.

**2144 • A Simple Method for Making Full-Fat Soy Flour**

W. J. ALBRECHT, G. C. MUSTAKAS, J. E. MCGHEE, and E. L. GRIFFIN, JR.  
 Cereal Sci. Today 12(3): 81-83. March 1967

A simple procedure is reported that gives soy flours which have good taste acceptance and should have good nutritive value. All the equipment is capable of manual operation and nominal in cost. The heat requirement is only that needed to boil the cook water. Adapting the process to a developing country

should not be difficult. However, environmental conditions could necessitate some alterations to the procedure; for example, drying the cooked soybeans in an area of very high humidity might require selection of the season or a modified drying method.

**2145 • Fine Grinding of Wheat Millfeeds and Whole Wheat for Industrial Use**

A. C. STRINGFELLOW, A. J. PEPLINSKI, and V. F. PFEIFER  
 Cereal Sci. Today 12(2): 43-45, 48, 60. February 1967

The fine grinding of principal millfeed products, bran, standard middlings, and red dog was investigated with various grinders (pin mill, saw tooth rotor grinder, and hammer mill) to determine the cost of

reduction to materials having maximum particle size ranging from 80 mesh on down to 230 mesh (U.S.).



**2146 • Reducing the Microbial Population of Flour During Milling**

CHARLES VOJNOVICH and V. F. PFEIFER

Cereal Sci. Today 12(2): 54-55, 58-60. February 1967

Any microbial population of products milled from wheat can be controlled by two simple treatments: (1) heating wheat before milling and (2) treating wheat with the epoxides ethylene oxide or propylene oxide before milling. Either treatment produces flour with a total microbial count of 500 per gram from wheat having an initial count of 1 million per gram. When wheat is heated, its subsequent milling must be carried out without contami-

nating the milled products. Attributes of this process are: (1) There is little damage to flour protein and none to the starch, (2) no chemicals are added to the flour, and (3) wheats of high microbial population can be treated effectively. Ethylene oxide and propylene oxide treatments can also be used with similar results. If wheat is treated before milling rather than flour after milling, chemical residues in the flour fraction are lower and flour damage is minimized.

**2147 • Graft Copolymers of Starch. III. Copolymerization of Gelatinized Wheat Starch with Acrylonitrile. Influence of Chain Modifiers on Copolymer Composition**

GEORGE F. FANTA, ROBERT C. BURR, C. R. RUSSELL, and C. E. RIST

J. Appl. Polym. Sci. 11(3): 457-463. March 1967

A study was made of the influence of selected chain modifiers on both the molecular weight of grafted polyacrylonitrile and the grafting frequency of the starch-polyacrylonitrile graft copolymer. Gelatinized wheat starch was used with ceric ammonium nitrate as the initiator. The organic chain modifiers investigated were ethyl mercaptan, 1-dodecanethiol, methyl ethyl ketone, acetaldehyde, and chloroform.

Sodium chromate, cupric bromide, cupric nitrate, cupric acetate, and cupric chloride were also tested as chain modifiers. In the presence of cupric chloride, there was a tenfold reduction in the molecular weight of grafted polyacrylonitrile; however, fewer chains were grafted to the starch backbone than were observed without cupric chloride.

**2148 • Nylon 1313: Synthesis and Polymerization of Monomers**JOSEPH L. GREENE, JR.,<sup>1</sup> EVERETT L. HUFFMAN,<sup>1</sup> ROBERT E. BURKS, JR.,<sup>1</sup> WILLIAM C. SHEEHAN,<sup>1</sup> and I. A. WOLFF(<sup>1</sup>Southern Research Institute, Birmingham, Ala.)

J. Polym. Sci., Part A-1, 5(2): 391-394. February 1967

Interest in *Crambe abyssinica* as an oilseed crop for the United States is based in part on its potential value as a source of polyamide monomers. *Crambe abyssinica* is one of the richest known sources of erucic (*cis*-13-docosenoic) acid, which makes up 55 to 60% of the acids of the seed oil glycerides. Erucic acid may be separated from crambe oil by fractional dis-

tillation of the free fatty acids obtained by hydrolysis of the glycerides. Alternatively, the oil may be converted to methyl esters, and the methyl erucate fraction from distillation hydrolyzed to the free acid. This paper describes the synthesis of nylon 1313 from erucic acid.

**2149 • Publications and Patents of the Northern Utilization Research and Development Division, July-December 1966**

North. Util. Res. Develop. Div.

U.S. Agr. Res. Serv., Unnumb. Pub., 42 pp. [January 1967]

**2150 • Preparation and Characterization of Intact and Free Spores of *Bacillus popilliae* Dutky**

GRANT ST. JULIAN, THOMAS G. PRIDHAM, and HARLOW H. HALL

Can. J. Microbiol. 13(3): 279-285. March 1967

Spores of *Bacillus popilliae* are enclosed within a large sporangium. In an effort to characterize the spores precisely, a method was developed to free them from their sporangia by sonic vibration. The free spores were separated from sporangial debris by lysozyme treatment, centrifugation, and the Sacks and Alderton aqueous polymer two-phase system. The spores are fully refractile; they accept and retain malachite green applied by a modified Wirtz spore-staining technique. The free spores are elongated with rounded ends and measure  $1.30\text{-}2.25\ \mu \times 0.90$

$-1.40\ \mu$ . Outgrowth of intact germinated spores is lowest when heat-activated at  $80^{\circ}\text{C}$ . and highest at  $50^{\circ}\text{C}$ . Free spores are more heat sensitive than are intact spores, possibly because of damage by the sonic treatment. L-Alanine, adenosine, and glucose separately and in combination do not influence germination of either intact or free spores. Although potassium phosphate somewhat increased germination of intact spores, other salts were ineffective, but almost all salts increased germination of free spores.

**2151 • Counter Double Current Distribution: Effects of Varying Number of Stages**

R. O. BUTTERFIELD, CONSTANCE K. TJARKS, and H. J. DUTTON

Anal. Chem. 39(4): 497-500. April 1967

By simulating counter double current distribution with continuous feed on a digital computer, the effects of varying the number of stages in the extraction train have been studied. Families of curves describing the relationship between the following sets of parameters were determined: (a) number of extraction stages, extraction coefficient, and transfers needed to achieve steady state; (b) number of extraction stages, extraction coefficient, and weight in feed tube at steady state; and (c) number of ex-

traction stages and limiting ratio of partition coefficients required to achieve specified yields and separations of two compounds. Mathematical equations were empirically determined for some of the observed relationships; these expressions can be used to predict the number of stages required for a given separation, the maximum concentration that will occur, and the number of transfers needed to obtain a steady state.

## 2152 • Linseed Oil Emulsions for Protecting Concrete

W. L. KUBIE and J. C. COWAN

J. Amer. Oil Chem. Soc. 44(3): 194-196. March 1967

Emulsions of boiled linseed oil have certain physical characteristics suitable for application to concrete both as curing and antispalling agents. This preliminary report gives methods of preparation, physical properties, and use of these compositions including examples of their application. The emulsions are comparable to solutions of boiled linseed oil in mineral spirits used to impart resistance of concrete to spalling. Emulsions not only create fewer fire

hazards than the solutions, but also permit easier cleaning of the equipment used in spraying. Tests show that the emulsions are effective in protecting air-entrained concrete from damage that results from the application of deicing materials and concurrent freeze-thaw cycles. Emulsions are effective both as curing and antispalling agents. Linseed oil was applied at the rate of 0.16 to 0.20 pound per square yard.

## 2153 • Reactions of Aldehyde Oils and Methyl Azelaaldehyde with Polyols

R. E. SHARPE,<sup>1</sup> D. A. BERRY,<sup>1</sup> E. H. PRYDE, and J. C. COWAN

(<sup>1</sup>Battelle Memorial Institute, Columbus, Ohio)

J. Amer. Oil Chem. Soc. 44(3): 167-170. March 1967

In exploratory tests, mono-, di-, and trialdehyde oils and methyl azelaaldehyde (MAZ), preferably in the form of their acetals, reacted with various polyols with few exceptions to produce potentially useful derivatives. The polyols included pentaerythritol, methyl glucoside, glucose, sorbitol, and poly(vinyl alcohol) (PVA). Preliminary evalua-

tion of some derivatives was carried out in several applications. Among the more promising were: films derived from MAZ and glucose or PVA; melt adhesives for non-polar substrates from trialdehyde oil and methyl glucoside; and molding compounds derived from MAZ and PVA.

## 2154\* • アフラトキシン\* —アメリカにおける研究を中心に—

[Aflatoxins--Centered Upon Research Carried Out in America]

C. W. HESSELTINE [Translated into Japanese by Aihara Kaggaki]

Kagaku (Tokyo) [Science]36(12): 667-672. December 1966

Current research in the United States on mycotoxins, including aflatoxins, is reviewed. Coordination of the work in the field is under a committee representing the specific laboratories and agencies concerned in the Departments of Agriculture; Health, Education, and Welfare; and Interior, as well as

members from industry, trade associations, and academic institutions. Problems of mycotoxins in agriculture are also summarized. These problems cover the growing plant, the seed, storage, and processing of foods. Finally, the program at the Northern Division is detailed.



## 2155 • Origin of Flavor in Foods. Nonenzymatic Browning Reactions

JOHN E. HODGE

In "The Chemistry and Physiology of Flavors."

eds. H. W. Schultz, E. A. Day, and L. M. Libbey, the fourth in a series of symposia on foods held at Oregon State College, Corvallis, September 8-10, 1965, chap. 22, pp. 465-491. Westport, Conn. 1967

The nonenzymatic browning reactions are not only a source of flavor (good and bad) in foods, but they may be used to synthesize some of the more desirable flavor compounds to add back to foods deficient in flavor. The Maillard reactions are the most important flavor-producing browning reactions that occur in foods on drying, processing, and cooking. For synthesizing the fragrant and more desirable browning products, the reactions of reducing sugars

with basic secondary amine salts are productive. With secondary amines the amine-elimination step goes readily, with the eventual production of flavorful C-methyl- $\alpha$ -dicarbonyl compounds. Sugar caramelization in the absence of amino compounds is fundamentally important for the production of flavor compounds and, possibly, for forming flavor-fixing oligosaccharides; it should not be neglected in flavor studies.

## 2156 • Structural Relationships, Kinetics, and Molecular Properties in the Acid Depolymerization of Amylose

H. L. GRIFFIN, STIG R. ERLANDER, and F. R. SENTI

Die Stärke 19(1): 8-17. January 1967

Intrinsic viscosity  $[\eta]$  and weight-average molecular weights ( $\bar{M}_w$ ) were determined for a series of dent corn amylose samples produced by acid hydrolysis of a butanol fraction of dent corn starch at 99.9°C. and pH 4.66. The Staudinger equation for the amylose samples in 4.2 M guanidine hydrochloride (GHC1) and water at 25°C. is:

$$[\eta] = 1.22 \times 10^{-3} \bar{M}_w^{0.50}$$

Both hydrolysis and intrinsic viscosity studies indicate

that dent corn amylose as separated by crystallization of the butanol complex behaves as a linear A-B type of condensation polymer. The results cannot rule out either the possibility of stub (comb) branching or the presence of barriers to  $\beta$ -amylose action such as phosphate groups or oxidized residues on the glucose monomer in the range reported by others; i.e., 0.1 to 0.3% apparent branching. The same radius of gyration is obtained for amylose in the solvents 0.1 N KOH, 0.5 N KOH, 4.2 M GHC1, dimethyl sulf-oxide, and 0.33 M KC1, whereas a much lower radius of gyration (about 33% lower) is obtained at pH 12.

## 2157 • Determination of Oil Contents of Dry-Milled Corn Fractions by Gas-Liquid Chromatography

L. T. BLACK, G. G. SPYRES, and O. L. BREKKE

Cereal Chem. 44(2): 152-159. March 1967

A method was developed to determine the oil content of dry-milled corn fractions by gas-liquid chromatography (GLC). Oil in ground corn was extracted and transesterified to methyl esters and the transesterification mixture analyzed directly by GLC. Corn oil samples treated identically (transesterified) served as standards for the determination.

The precision for the method is high, especially below the 1% oil level, the relative standard deviation being  $\pm 3.6\%$ . Typical nonoil foreign matter will not interfere with the determination, since the analysis is specific for glyceride oils. This method has also been applied to the determination of oil in other oilseed materials.

**2158 • Anomalous Rearrangement of Oxidized Xanthate Derivatives of *D*-Mannose and *D*-Mannitol**

W. M. DOANE, B. S. SHASHA, C. R. RUSSELL, and C. E. RIST  
J. Org. Chem. 32(4): 1080-1083. April 1967

Xanthation of 2,3:5,6-di-*O*-isopropylidene-*D*-mannose followed by coupling with iodine at 0° gave crystalline bis(1-*S*-carbonyl-2,3:5,6-di-*O*-isopropylidene-1-thio-*D*-mannofuranose) disulfide (II) while none of the expected bis(*O*-thiocarbonyl) disulfide derivative could be isolated. Compound II decomposed on standing in different organic solvents to carbonyl sulfide and crystalline bis(2,3:5,6-di-*O*-isopropylidene- $\alpha$ -*D*-mannofuranosyl) disulfide (IV). The structure of

IV was proved by its independent synthesis and by its conversion to 1,4-anhydro-*D*-mannitol. Xanthation of 2,3:5,6-di-*O*-isopropylidene-*D*-mannitol (VI) followed by coupling with iodine gave the corresponding bis(*O*-thiocarbonyl) disulfide derivative (VII). On standing in pyridine, VII decomposed to elemental sulfur, carbon disulfide, VI, and a high-melting crystalline compound shown to be bis(2,3:5,6-di-*O*-isopropylidene-*D*-mannitol) orthocarbonate (VIII).

**2159 • Ethylidene Derivatives of *D*-Erythrose. I. 2,3-*O*-Ethylidene- $\beta$ -*D*-Erythrofuranose**

J. W. VAN CLEVE and C. E. RIST  
Carbohyd. Res. 4(1): 82-90. March 1967

The principal product of the acidic rearrangement of 2,4-*O*-ethylidene-*D*-erythrose, and of the ethyldienation of *D*-erythrose in aqueous acid, is 2,3-*O*-ethylidene-*D*-erythrose. The structure of this previously reported compound, which has been isolated in the crystalline  $\beta$ -*D*-furanose form, has been confirmed by unequivocal proof.

The ethylidene ring of this *D*-erythrose acetal has a profound effect on the properties anticipated for a reducing sugar. Reactions of the aldehyde group are hindered, and hemiacetal formation gives only the  $\beta$ -*D*-furanose form; and  $\alpha$ -*D*-anomeric hydroxyl group would be sterically hindered. No mutarotation is observed, and acylation gives derivatives of the  $\beta$ -*D* anomer only.

**2160 • Synthesis of 3-*O*-Benzyl-*D*-Erythrose**

J. W. VAN CLEVE and C. E. RIST  
Carbohyd. Res. 4(1): 91-95. March 1967

3-*O*-Benzyl-*D*-erythrose has been synthesized from 2,4-*O*-ethylidene-*D*-erythrose in four steps. The methylphenyl hydrazone (85 to 90% yield) was benzylated in *N,N*-dimethylformamide with benzyl bromide and silver oxide to give 3-*O*-benzyl-2,4-*O*-ethylidene-*D*-erythrose (2-methyl-2-phenyl)hydrazone (90 to 95% yield). The methylphenyl hydrazine residue was re-

moved by heating the substituted hydrazone with aqueous acetaldehyde in an autoclave at 80° C., to give 3-*O*-benzyl-2,4-*O*-ethylidene-*D*-erythrose in 40% yield. Its mild acidic hydrolysis produced, in quantitative yield, syrupy 3-*O*-benzyl-*D*-erythrose, characterized as the (*p*-nitrophenyl)hydrazone and the (*p*-bromophenyl)osazone.



**2161 • Migration of the *p*-Nitrobenzoyl Group. An Attempted Preparation of 1,3-Di-*O*-*p*-Nitrobenzoyl-*D*-Erythritol**

J. W. VAN CLEVE and C. E. RIST

Carbohydr. Res. 4(1): 95-96. March 1967

We have extended to the di-*p*-nitrobenzoates of erythritol the study of the migration of aroyl ester groups under acidic conditions. Reduction of 2,4-*O*-ethylidene-*D*-erythrose to the corresponding erythritol derivative, followed by esterification with *p*-nitroben-

zoyl chloride in pyridine, gave optically active 2,4-*O*-ethylidene-1,3-di-*O*-*p*-nitrobenzoyl-*D*-erythritol. This compound, on mild hydrolysis with acid, yielded, not the anticipated 1,3-diester, but the known 1,4-di-*O*-*p*-nitrobenzoylerythritol.

**2162 • Isolation and Chemical Comparison of Different Gamma-Gliadins from Hard Red Winter Wheat Flour**

F. R. HUEBNER, J. A. ROTHFUS, and J. S. WALL

Cereal Chem. 44(2): 221-229. March 1967

By a combination of ion-exchange and gel-filtration chromatography,  $\gamma$ -gliadin has been separated into three different proteins. Elution of gliadin from sulfoethyl cellulose (SEC) columns with a nonlinear sodium chloride gradient (0.01-0.3 *M*) contained in 2 *M* dimethyl-formamide-0.1 *M* acetate buffer (pH 2.1) gave three peaks, each of which contained a component having a mobility in the range ascribed to  $\gamma$ -gliadin on starch-gel electrophoresis. Contaminating  $\beta$ -gliadins contained in two of the peaks were eliminated by subsequent chroma-

tography on SEC in 5 *M* urea at pH 2.5 and by gel filtration through a 200-cm. column of crosslinked dextran in 0.05 *M* acetic acid. The behavior of  $\gamma$ -gliadin during SEC chromatography was due to heterogeneity of the protein fraction rather than to molecular aggregation. Separated  $\gamma$ -gliadins migrated at slightly different rates upon electrophoresis in starch gel and differed significantly in content of lysine, tryptophan, tyrosine, phenylalanine, glutamic acid, and proline.

**2163 • Protein Composition of Dent, Waxy, and High-Amylose Corns**

JOYCE A. BOUNDY, J. H. WOYCHIK, R. J. DIMLER, and J. S. WALL

Cereal Chem. 44(2): 160-169. March 1967

Protein content and composition were examined for three corns, alike in hereditary factors except for *ae* and *wx* genes which determine the amylose and amylopectin contents of the starches. Globulin, zein, and glutelin proteins, prepared by selective extractions from dent, waxy, and high-amylose corns, were subjected to gel electrophoresis and amino acid analysis to elucidate possible variations in proteins. No differences were observed in the electrophoretic patterns of the proteins from the different genotypes.

Although the globulins and zeins from the different strains were similar in amino acid content, the glutelin fractions differed significantly. The starch-gel electrophoretic patterns and amino acid compositions of reduced globulins, zeins, and glutelins from dent corn were also compared. Reduced glutelin electrophoretic components have counterparts in reduced zein and reduced globulins; also, amino acid composition of the glutelin is intermediate between those of the other two proteins.



# 2164 • Solubility and Ultracentrifugal Studies on Soybean Globulins

A. M. NASH and W. J. WOLF

Cereal Chem. 44(2): 183-192. March 1967

Solubilities of laboratory and commercial preparations of soybean globulins were measured in 0.5 ionic strength, pH 7.6, potassium phosphate-sodium chloride buffer. Measurements with and without 0.01 *M* 2-mercaptoethanol in the buffer gave an estimate of insoluble disulfide polymers. Compositions of the soluble proteins were determined by ultracentrifugation.

Five laboratory samples of soybean globulins prepared by isoelectric precipitation and freeze-drying had solubilities of 37 to 73% in buffer and 66 to 78% in buffer containing 2-mercaptoethanol; whereas five commercial globulin samples in the isoelectric form had respective solubilities of 6 to 59% and 10 to

66%; and seven commercial soybean proteinate samples ranged from 6 to 81% in buffer as compared to 13 to 83% in buffer containing 2-mercaptoethanol.

Solubilities of all samples were increased by 2-mercaptoethanol, but wide variations occurred. Ultracentrifugal analysis also showed large variations in the compositions of different samples. Some commercial preparations closely resembled laboratory samples in solubilities and ultracentrifugal compositions. Other commercial samples had low protein solubilities and appeared extensively modified by the isolation process. Samples of lecithinated proteinate, pepsin-hydrolyzed protein, and alkali-modified protein were included for comparison.

# 2165\* • *Afzelia cuanzensis* Seed Oil: A Source of Crepenynic and 14,15-Dehydrocrepenynic Acid

F. D. GUNSTONE,<sup>1</sup> D. KILCAST,<sup>1</sup> R. G. POWELL, and G. M. TAYLOR<sup>1</sup>

(<sup>1</sup>University of St. Andrews, Fife, Scotland)

Chem. Commun. (6): 295-296. March 1967

The presence of crepenynic acid in seed oil of the leguminous tree *Afzelia cuanzensis* was established. That seed oil also contained 14,15-dehydrocrepenynic

acid, the first report of its isolation from a higher plant source.

# 2166 • Emulsification of Linseed Oil. I. Effects of Oil Viscosity, Temperature, Time of Agitation, and Age of Emulsions on Particle Size Distribution

L. H. PRINCEN, J. A. STOLP, and W. F. KWOLEK<sup>1</sup>

(<sup>1</sup>USDA Biometrical Serv., Peoria, Ill.)

J. Paint Technol. 39(507): 182-187. April 1967

Linseed oils of various viscosities were emulsified at different temperatures under identical mechanical conditions. The particle size distributions of these emulsions were studied at ages up to 40 weeks with a Coulter counter. Highly viscous oils decrease in mean particle size as agitation time is increased, but oils with viscosities below 1,600 centipoises reach equilib-

rium particle-size distribution within the first 10 minutes of shear. This behavior is explained in terms of shearing force, oil viscosity, and emulsifier system. Special attention is given to the amount of water evaporated during the emulsification process and its effect upon the interpretation of Coulter counter data.

**2167 • Emulsification of Linseed Oil. II. Fitting the Truncated Log Normal Distribution with Coincidence Corrections to Coulter Counter Data**

W. F. KWOLEK,<sup>1</sup> L. H. PRINCEN, and R. L. GREENSPUN<sup>2</sup>

(<sup>1</sup>USDA Biometrical Serv., Peoria, Ill.; <sup>2</sup>USDA Biometrical Serv., Beltsville, Md.)

J. Paint Technol. 39(507): 188-190. April 1967

A procedure is described for estimating two parameters—mean particle size and standard deviation—for oil-in-water emulsions assuming the log normal distribution of particle diameters. A minimum chi-square, computed from observed and expected fre-

quencies of particle counts, serves as the criterion for determining the two estimates. Coincidence corrections are introduced in the computation, and the distribution of counts may be truncated. Typical results are given for five emulsions.

**2168 • New Fermented Cereal Products**

C. W. HESSELTINE, MABEL SMITH, and HWA L. WANG

Develop. Ind. Microbiol. 8(20): 179-186. 1967

New fermented tempeh-type products were prepared from wheat, oats, rye, barley, rice, and combinations of rice or wheat with soybeans by selecting strains of *Rhizopus oligosporus* from the Indonesian tempeh fermentation. All fermentations were carried out at 31° C. for 24 hours or less. The products possess a pleasant odor, a desirable color, and an

acceptably mild taste. Fermentations may be carried out in either shallow perforated trays or perforated plastic packages. The fermentation products may be preserved for at least a month by freezing. Data are given on the changes of temperature and weight losses due to fermentation, as well as on methods of modifying flavor.

**2169 • Pentacyclic Triterpenes of *Jurinea anatolica* Boiss. and *Jurinea consanguinea* DC. Fruit**

K. L. MIKOLAJCZAK and C. R. SMITH, JR.

Lipids 2(2): 127-132. March 1967

Pentacyclic triterpene alcohols, together with their acetate, myristate, and palmitate esters, comprise about 40% of the petroleum ether extract of the fruit (seed and pericarp) of two *Jurinea* species. All the triterpene esters and a portion of the free triterpene alcohols in the *J. anatolica* extract are derived from the pericarp portion of the fruit. The triterpene alcohol moieties and their approximate percentage of

the hydrolyzed extract of *J. anatolica* fruit are  $\alpha$ -amyirin, 5%;  $\beta$ -amyirin, 6%; lupeol, 6%; and  $\psi$ -taraxasterol plus taraxasterol, 16%. *J. consanguinea* fruit extract yields essentially the same amount of the same five triterpene alcohols on hydrolysis. These concentrations of triterpenoid materials are believed to be the largest found in plant tissues.

- 2170 • **Fungistatic Action of Aflatoxin B<sub>1</sub>**  
E. B. LILLEHOJ, A. CIEGLER, and H. H. HALL  
Experientia 23: 187-190. March 1967

Growth of several species of *Aspergillus* and *Penicillium* was inhibited by aflatoxin B<sub>1</sub> when grown in a modified Czapek's medium. Growth

inhibition caused by aflatoxin B<sub>1</sub> could be reversed if yeast extract was substituted for sodium nitrate as the nitrogen source.

- 2171 • **Full-Fat Soy Flour**  
E. L. GRIFFIN  
Proc. Conf. Adv. Food Processing, held at New Orleans, La., March 22-24, 1965  
South. Util. Res. Develop. Div.  
U.S. Agr. Res. Serv., ARS-72-55, pp. 44-52. March 1967

Processing and food studies are described that indicate a full-fat soy flour of high nutritive value,

mild flavor, and good oxidative stability can be produced by extruder cooking.

- 2172 • ***cis*-5,*cis*-9,*cis*-12-Octadecatrienoic and Some Unusual Oxygenated Acids in *Xeranthemum annuum* Seed Oil**  
R. G. POWELL, C. R. SMITH, JR., and I. A. WOLFF  
Lipids 2(2): 172-177. March 1967

Seed oil of *Xeranthemum annuum* (family Compositae) contains a number of unusual fatty acids in addition to palmitic, stearic, oleic, linoleic, and linolenic. These acids include *cis*-5,*cis*-9,*cis*-12-octadecatrienoic, 5%; *cis*-9-L,10-L-epoxyoctadecanoic, 3%;

*cis*-9,L,10-L-epoxy-*cis*-12-octadecenoic (coronatic), 8%; and *cis*-12,D,13-D,epoxy-*cis*-9-octadecenoic (vernolic), 2%; as well as a mixture of two hydroxy acids, 11%. The absolute configurations of the two 9,10-epoxy acids are established for the first time.

- 2173 • **Metabolic Conversions and the Positional Distributions in Liver Lecithin of Some Unnatural Dienoic Acids in the Rat**  
HOWARD W. SPRECHER,<sup>1</sup> H. J. DUTTON, F. D. GUNSTONE,<sup>2</sup> P. T. SYKES,<sup>2</sup> and RALPH T. HOLMAN<sup>3</sup>  
(<sup>1</sup>Ohio State University, Columbus; <sup>2</sup>University of St. Andrews, Fife, Scotland; <sup>3</sup>The Hormel Institute, Austin, Minn.)  
Lipids 2(2): 122-126. March 1967

The metabolism of 9,15-octadecadienoate, 12,15-octadecadienoate, and 7,13-eicosadienoate was investigated in the fat-deficient rat. Liver lecithins were isolated from animals receiving 9,15- and 12,15-octadecadienoate, as well as from those remaining on the fat-deficient control. The fatty acid distributional pattern was determined by the use of lecithinase A.

All three of the experimental dienoic acids were incorporated into tissue lipids. None of the acids, however, were converted to longer chain polyunsaturated fatty acids. The 9,15-octadecadienoate was esterified almost exclusively to the  $\beta$ -position of lecithin, whereas 12,15-octadecadienoate was about equally distributed between the  $\alpha$ - and  $\beta$ -position.



## 2174 • Radiochemical Studies on the Production of Starch in Plants. I. Theoretical Equations

STIG R. ERLANDER

Die Stärke 19(2): 42-48. February 1967

Equations were developed that enable calculation of the apparent percentage of amylose during the time of radioactive starch synthesis in a plant. These calculations were necessary to determine whether amylose and amylopectin are labeled randomly for specific time periods. Application of these

equations should provide information on how starch is synthesized. Also examined was the compartment theory, which assumes the formation of a dextrin (or glycogen) and the precipitation of this dextrin as amylopectin.

## 2175 • Production of Glycogen in Various Genetic Corn Endosperms

STIG R. ERLANDER and H. L. GRIFFIN

Die Stärke 19(2): 34-41. February 1967

Properties of soluble polysaccharides of plant endosperms are important because these soluble polysaccharides may represent precursors of the starch granule. A study was made of the degree of branching,  $\beta$ -amylolysis limit, and molecular weight of the soluble polysaccharides from ordinary dent, waxy, and high-amylose (70% apparent amylose) corn endosperms. Soluble amylose was found in the ordinary dent and high-amylose endosperms but not in the waxy endosperms. Since amylose from the solubles of ordinary dent corn endosperm was lower in molecular weight than that from the corresponding starch, possibly soluble amylose is a composite of

different stages of molecular development. The branched fractions of the endosperm solubles have essentially the same  $\beta$ -limit and degree of branching for all three varieties and consist of an amylopectin-like fraction and a glycogen-like fraction. The amylopectin-like fractions from the solubles of dent and waxy corn and the corresponding amylopectins from their starches have the same  $\beta$ -limit and degree of branching while the glycogen-like fraction resembles sweet corn glycogen and animal glycogen. The weight-average molecular weights of the branched fractions are large (approximately  $35 \times 10^6$ ).

## 2176 • A Mucopolysaccharide Containing Hydroxyproline from Corn Pericarp. Isolation and Composition

J. A. BOUNDY, J. S. WALL, JAMES E. TURNER, J. H. WOYCHIK, and R. J. DIMLER

J. Biol. Chem. 242(10): 2410-2415. May 1967

A plant protein-polysaccharide complex extracted from corn (*Zea mays*) pericarp with 15% trichloroacetic acid contains hydroxyproline as a significant constituent of its protein or polypeptide moiety. Hydroxyproline, serine, and threonine, present in nearly equimolar amounts, constitute one-third of the amino acid residues. The polysaccharide portion of this material contains glucose in major amounts

along with galactose, arabinose, and xylose. It also contains glucosamine. Enzymic digestions remove much of the hexose-containing polysaccharide and leave a homogeneous core that contains most of the hydroxyamino acids and glucosamine. The resistance to extensive efforts to resolve the carbohydrate and protein moieties by physical means suggests that the associated material is a mucopolysaccharide.

**2177 • Products from Soybeans. To Meet Rising Processor Interest, Tofu Process--On a Laboratory Scale**

HWA L. WANG

Food Technol. 21(5): 115-116. May 1967

Since 1920, several investigators have described the essential steps in making tofu and its composition. In 1960, the Northern Laboratory detailed a method for making tofu on a pilot-plant scale. The equipment necessary for this operation is large, not readily available, and rather expensive. Our work on cheese from soybeans, especially Chinese cheese, involves making small amounts of tofu before the

cheese fermentation. There have been numerous requests by research laboratories interested in cheese from soybeans for a procedure to make small amounts of tofu without the purchase of large, expensive equipment. This note describes a laboratory-scale process for making tofu and the simple, inexpensive apparatus used.

**2178 • Crosslinking of Poly(Ester- and Amide-Acetals): Preliminary Studies with Glass Substrates**

W. R. MILLER, E. H. PRYDE, C. M. THIERFELDER, E. S. MOOBERRY, and J. C. COWAN

J. Paint Technol. 39(509): 389-393. June 1967

Adherent, solvent-resistant coatings were prepared by crosslinking poly(ester-acetals) and poly(amide-acetals) on a glass surface. Crosslinking at 275° C. for 0.5 hour with zinc or lead salts gave hard, clear, brown films. Coatings from poly(ester-acetal) were inert to organic solvents and 5% hydrochloric acid but dissolved slowly in 5% sodium hydroxide. Poly-

(amide-acetal) coatings were also solvent-resistant but were more resistant to 5% sodium hydroxide. Peroxide catalysts gave nonadherent poly(ester-acetal) films, resistant to caustic but not to chloroform. Potential uses for these new films include protective and decorative coatings for glass containers and in glass-reinforced plastics.

**2179 • Homogeneous Hydrogenation of Methyl Linolenate Catalyzed by Platinum-Tin Complexes**

E. N. FRANKEL, E. A. EMKEN, HIROSHI ITATANI,<sup>1</sup> and JOHN C. BAILAR, JR.<sup>1</sup>  
(<sup>1</sup>University of Illinois, Urbana)

J. Org. Chem. 32(5): 1447-1452. May 1967

Methyl linolenate was hydrogenated at 500 p.s.i. in the presence of chloroplatinic acid, hydridochlorobis(triphenylphosphine)platinum(II), and dichlorobis(triphenylarsine)platinum(II), each in mixture with stannous chloride in methanol-benzene solution. Dienes and monoenes were formed as major products. Conjugated dienetrienes and conjugated trienes were important initial and intermediate products. No stearate was formed. With the bimetallic complex, trichlorotin-hydridobis(triphenylphosphine)platinum(II), conversion of linolenate into conjugated dienetrienes was the major reaction. In pure methanol solution, homogeneous hydrogenation with chloroplatinic

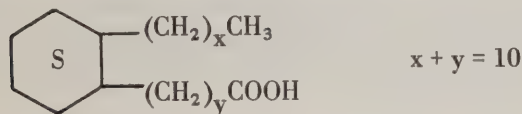
acid and stannous chloride occurred at atmospheric pressure. Although at 30° C. considerable conjugation of linolenate occurred, at 40° the hydrogenation was highly selective for the formation of diene. The mechanism advanced for the homogeneous hydrogenation involves initial conjugation through platinum-tin-diene adducts. Hydrogenation of the intermediate conjugated dienetrienes and conjugated trienes produces a mixture of isomeric *trans* monoenes and dienes. Formation of unreactive dienes with double bonds separated by several methylene groups accounts for the high selectivity of these platinum-tin catalysts for the formation of dienes from methyl linolenate.

**2180 • C<sub>18</sub>-Saturated Cyclic Acids from Linseed Oil: A Structural Study**

J. P. FRIEDRICH

J. Amer. Oil Chem. Soc. 44(4): 244-248. April 1967

The preparation of C<sub>18</sub>-saturated cyclic acids from linseed oil (HCal) by heat treatment in the presence of alkali, followed by hydrogenation and subsequent isolation of the cyclic fraction, gives rise to a series of at least 11 isomers as evidenced by gas-liquid chromatography. Eight of these isomers have now been shown to be geometric pairs of positional isomers with the following general formula:



An unequivocal synthesis of isomers ( $x = 0, 1, 2, \text{ \& } 3$ )

indicates that the principal positional isomer (ca. 55%) of HCal is 9-(2'-*n*-propylcyclohexyl)-nonanoic acid. This isomer undoubtedly results from the cyclization of 10,12,14-octadecatrienoic acid present in the isomerized mixture. The predominance of this isomer is further substantiated by mass spectral analysis. The four positional isomers prepared constitute about 80% of the mixture as determined by gas-liquid chromatography. The four synthetic aromatic positional isomers show single peaks, whereas their hydrogenated counterparts show two peaks. Thus each of these positional isomers of HCal is composed of two geometric isomers.

**2181 • Preparation of Esters, Hydrazides, and Amides of Carboxymethyldimethyl Long-Chain Aliphatic Ammonium Chlorides**

C. L. MEHLTRETTER

J. Amer. Oil Chem. Soc. 44(4): 219-220. April 1967

A series of hydrazides and amides of carboxymethyldimethyl C<sub>12</sub>-C<sub>18</sub> aliphatic ammonium chlorides were prepared by reaction of the corresponding ethyl esters with hydrazine and alcoholic ammonia, respectively. The intermediate carbethoxymethyldi-

methyl derivatives were readily synthesized from commercial dimethyl tertiary amines and ethyl chloroacetate. The crude products were obtained in high yields and, after recrystallization, chemical analysis verified the expected structures.

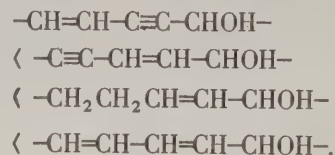


**2182 • Geometric Configuration and Etherification Reactions of Some Naturally Occurring 9-Hydroxy-10,12- and 13-Hydroxy-9,11-Octadecadienoic Acids**

R. G. POWELL, C. R. SMITH, JR., and I. A. WOLFF  
J. Org. Chem. 32(5): 1442-1446. May 1967

The hydroxy acids in *Xeranthemum annuum* seed oil are 9-hydroxy-*trans*-10,*cis*-12-octadecadienoic and 13-hydroxy-*cis*-9,*trans*-11-octadecadienoic. Their geometric configurations were established by partial reduction of the corresponding methyl esters (1 and 2) with diimide and by subsequent oxidative cleavage of the isolated *cis*-monoene products. Hydrazine/oxygen was not suitable as a diimide source for reduction of esters 1 and 2, but potassium azodicarboxylate was. The acid-catalyzed etherification reactions of these

conjugated dienols (1 and 2), as well as of their allylic reduction products (4 and 11), were explored. The ease of acid-catalyzed etherification of  $\alpha,\beta$ -unsaturated secondary alcohols increases in the order:



**2183 • Refinements in Control Viscometry**

R. W. GOETZ,<sup>1</sup> T. D. WHEELOCK,<sup>1</sup> H. F. CONWAY, and E. B. LANCASTER  
(<sup>1</sup>Iowa State University, Ames)  
Cereal Sci. Today 12(4): 151, 153-156, 158. April 1967

The simple cooking viscometer developed at the Northern Division for controlling the degree of reaction in a process for acid-modifying flour was used for kinetic studies, as a small-scale preparative cooker for examining the effects of high-shear cooking, and with a constant-temperature bath to compare the consistency of prepared materials. Its reliability

as a research, rather than a control, instrument exceeded expectations, although reduction of mixer speed under load was objectionable. Precision, accuracy, and simplicity of operation are improved so that this kind of equipment should appeal to many users.

**2184 • Open-Cell Urethane Foam from Starch-Derived Polyethers**

F. H. OTEY, BONNIE L. ZAGOREN, C. L. MEHLTRETTER, and C. E. RIST  
J. Cell. Plast. 3(5): 233-235. May 1967

One-shot rigid urethane foam with more than 90% open cells was prepared by incorporating 1 to 2% dipotassium  $\alpha$ -sulfostearate in formulations based on commercial isocyanates and conventional polyethers. When organophosphorus materials were added,

0.5 to 0.7% salt was sufficient to produce a high percentage of open cells. Properties of the open-cell foam are compared with those of corresponding closed-cell foams.

**2185 • Brassylic Acid from Ozonolysis of Erucic Acid**H. J. NIESCHLAG, I. A. WOLFF, T. C. MANLEY,<sup>1</sup> and R. J. HOLLAND<sup>1</sup>(<sup>1</sup>The Welsbach Corporation, Philadelphia, Pa.)

Ind. Eng. Chem., Prod. Res. Develop. 6(2): 120-123. June 1967

In bench-scale experiments, 98% brassylic acid was recovered in 70% of theoretical yield by ozonolysis of erucic acid. Alternatively, 95% dimethyl

brassyate was isolated in 88% yield. Brassylic acid of 95% purity was produced in a continuous pilot-plant process.

**2186\* • Manufacture of Wheat Starch**

ROY A. ANDERSON

*In* "Starch: Chemistry and Technology. Industrial Aspects," vol. II, eds.

Roy L. Whistler and Eugene F. Paschall, pp. 53-63. New York. 1967

Methods of manufacturing wheat starch are reviewed, beginning with very early procedures and

progressing to the latest innovations.

**2187\* • Production and Use of Dialdehyde Starch**

C. L. MEHLTRETTER

*In* "Starch: Chemistry and Technology. Industrial Aspects," vol. II,

eds. Roy L. Whistler and Eugene F. Paschall, pp. 433-444. New York. 1967

The development and applications of dialdehyde starch are described.

**2188\* • High-Amylose Corn Starch: Its Production, Properties, and Uses**

F. R. SENTI

*In* "Starch: Chemistry and Technology. Industrial Aspects," vol. II,

eds. Roy L. Whistler and Eugene F. Paschall, pp. 499-522. New York. 1967

Hybrid corn varieties are now available which produce starches that contain more than 50% "apparent" amylose. Such high-amylose corn varieties that are agronomically adapted to commercial production are designated by the generic term "amylomaize." Kernel properties of amylomaize are described as well as wet milling to recover starch

having a high content of amylose. Properties of amylomaize starches of different levels of amylose content are discussed in terms of granule birefringence, iodine staining, X-ray diffraction patterns, gelatinization, dispersion, molecular components, and chemical modifications. Potential uses for amylomaize starches are also reviewed.

**2189 • Insect Control, Biological**

H. H. Hall

*In "Yearbook of Science and Technology,"* ed. David I. Eggenberger, pp. 198-200. New York. 1967

Insects, like man and animals, are subject to depredations by many natural enemies, including infectious diseases. Numerous bacteria, fungi, viruses, protozoa, nematodes, and predatory insects are capable of killing their host insect. A limited number of

species cause appreciable reductions in populations of harmful insects and of useful insects as well. The problem of management of these pathogenic microorganisms in the insect world is twofold: protection of useful insects and destruction of unwanted insects.

**2190 • Polysaccharides, Microbial**

M. E. SLODKI

*In "Yearbook of Science and Technology,"* ed. David I. Eggenberger, pp. 315-317. New York. 1967

The most prevalent type of extracellular polysaccharides elaborated by microorganisms are those containing uronic acid residues. Polysaccharide formation is far more numerous among bacteria than among yeasts and molds. The different kinds of

polysaccharides produced, regardless of origin, have taxonomic value. The remarkable physical properties of these materials make them suitable for emulsifying, thickening, or gelling agents in the food and pharmaceutical industries.

**2191 • Infrared Analysis of Methyl Stearates Containing Deuterium**

W. K. ROHWEDDER, C. R. SCHOLFIELD, HENRY RAKOFF, JANINA NOWAKOWSKA, and H. J. DUTTON

*Anal. Chem.* 39(7): 820-823. June 1967

Infrared spectra of methyl stearates specifically labeled with deuterium at or near the 9-10 carbon atoms were measured to provide a basis for quantitative determination of deuterium content and to determine the relative amounts of CHD and CD<sub>2</sub> on unknown stearates. Integrated linear absorbance gave

good quantitative correlations with deuterium content determined mass spectrometrically. The infrared spectrum is given of methyl esters of a mixture of perdeutero fatty acids extracted from the algae *Scenedesmus obliquus* grown in 99.7% D<sub>2</sub>O.



**2192 • Mixed Esters of Brassylic Acid as Plasticizers for Poly(vinyl chloride)**

H. J. NIESCHLAG, W. H. TALLENT, I. A. WOLFF, W. E. PALM,<sup>1</sup> and L. P. WITNAUER<sup>1</sup>

(<sup>1</sup>East. Util. Res. Develop. Div., Philadelphia, Pa.)

Polym. Eng. Sci. 7(1): 51-54. January 1967

Two mixed esters and two diesters of brassylic (tridecanedioic) acid were prepared and incorporated into poly(vinyl chloride) (PVC) at levels of 10, 20, 30, and 40% for evaluation as plasticizers. Two commercial plasticizers, bis(2-ethylhexyl) phthalate (I) and bis(2-ethylhexyl) sebacate (II), were used as controls. At the 30% level, dibutyl brassylate has much better light stability than II; their low-temperature characteristics are about equal. Properties of dicyclohexyl brassylate and I are similar at all

plasticizer levels although the dicyclohexyl brassylate has lower volatility. Some modification of plasticizer properties was achieved in the mixed esters. Incorporating a cyclohexyl moiety effects a lowering of migration and volatility. The 2-ethylhexyl cyclohexyl brassylate has better low-temperature flexibility and lower volatility than I and lower migration and much better light stability than II. In general, brassylate plasticizers contribute excellent light stability to PVC.

**2193 • X-Ray Diffraction of Oriented Amylose Fibers. I. Amylose Dimethyl Sulfoxide Complex**

A. D. FRENCH and H. F. ZOBEL

Biopolymers 5(5): 457-464. June 1967

The amylose-dimethyl sulfoxide complex has been investigated with the aid of X-ray diagrams of oriented fibers. The amylose occurs in a six-residue helix with alternate "up" and "down" chains packed

in a square array; that is, pseudo-tetragonal. A unit cell is proposed with  $a = b = 19.21$  Å and with  $c = 8.12$  Å.

**2194 • Chromatography of Polar Triglycerides on Silicic Acid Columns**

C. D. EVANS, D. G. McCONNELL, R. L. HOFFMANN, and HELEN PETERS

J. Amer. Oil Chem. Soc. 44(5): 281-283. May 1967

Triglycerides containing polar fatty acids are resolved by silicic acid chromatography into molecular species containing increased amounts of the polar acids. Natural fats like isano, oiticica, castor, or kamala seed oils with both nonpolar fatty acids and

polar hydroxy or keto acids have been resolved into component glycerides according to the degree of polarity. Silicic acid chromatography offers a means of obtaining specific glycerides from fats for detailed studies on glyceride composition and structure.

**2195 • Determination of Unsaturation in Oils in the Presence of Saturated Aldehydes**

L. T. BLACK and R. E. BEAL

Lipids 2(3): 280-282. May 1967

A graphical method was developed for applying the hydrogenation procedure of Brown to the determination of unsaturation in oils in the presence of aldehydes. This method is useful for characterizing unsaturated aldehyde oils prepared from soybean

and linseed oils for use in protective coating studies. Good agreement was found between calculated and experimental hydrogen iodine values on prepared mixtures of unsaturated oils or esters and aldehydes.

**2196 • Release of Proteinase from Mycelium of *Mucor hiemalis***

HWA L. WANG

J. Bacteriol. 93(6): 1794-1799. June 1967

When *Mucor hiemalis* NRRL 3103 was grown in soybean medium, only a small fraction of the proteinase produced by the organism appeared in the culture filtrate, whereas the bulk of the enzyme was bound to the mycelial surface. Optimal pH of the proteinase ranged from 3.0 to 3.5. Inclusion of sodium chloride or other ionizable salts in the growth medium, however, liberated from the mycelium the loosely bound enzyme as it was formed. Maximal release of proteinase was achieved at a sodium chloride concentration of 0.5 M. The loosely bound proteinase was eluted also from intact resting mycelium by ionizable salts but not by water or non-ionizable substances. The amount of enzyme eluted from the mycelium depended upon the concentration

of sodium chloride up to 0.3 M. Since liberation took place rapidly even at 0° C., a loose ionic linkage must exist rather than a biochemical binding of the enzyme to the mycelium. The recovery of proteolytic activity from repeated salt extraction was greater than that originally detected in the intact mycelium, possibly owing to unmasking of more active enzymes or functional groups. Further proteinase activity was released when salt-extracted mycelium was ruptured. Part of the proteinase was firmly attached to the cell fraction, while part appeared in the supernatant. These conditions implied the presence of intracellular or firmly attached proteinase which could be partially released.

**2197\* • Hydrolysis Polymerization**

W. R. MILLER

In "The Encyclopedia of Chemistry," 2nd ed., ed. George L. Clark, p. 531.  
New York. 1966

Hydrolysis-polymerization is a novel technique for preparation of poly(ester-acetals) in which the ketal of a glyceryl monoester-acetal, e.g., isopropylideneglyceryl azelaaldehyde dimethyl acetal (I), is converted to a poly(ester-acetal) at an aqueous-organic interface. This technique was discovered in the attempted preparation of  $\alpha$ -glyceryl azelaaldehyde by hydrolysis of I, which gave viscous oils instead of the expected monomer. The ester-aldehyde freed by hydrolysis apparently reacts rapidly with

other molecules of ester-aldehyde to form poly(ester-acetal). The products so far obtained have been low-molecular-weight oligomers with maximum molecular weight of about 1500. Hydrolysis of the glyceryl ester apparently terminates the polymerizing chain. The resultant free carboxyl group will form salts and esters. The sodium salt has surfactant properties. The methyl ester and the free acid can each be further polymerized.

- 2198\* • **Amerikada Soya Yağı Nerelerde Kullanilir?**  
**[Use of Soybean Oil in the United States]**  
 J. C. COWAN [Translated into Turkish by Nuriye Celkan]  
 Yağ ve Protein 4(47-48): 2,4. February-March 1967

Statistics are summarized of the steadily increasing outlets in the United States for soybean oil. Data

cover such food uses as shortening, margarine, and cooking and salad oil.

- 2199 • **Effect of Phosphate Buffer on Dispersed Starch. II. Extrapolated Molecular Weight of Amylopectin**  
 STIG R., ERLANDER and R. TOBIN  
 Die Starke 19(4): 94-99. April 1967

Waxy corn starch dispersed at room temperature by using 5 M lithium thiocyanate plus 2.5 M guanidinium thiocyanate yields an amylopectin solution that contains a hydrolytic enzyme. This enzyme does not become active unless inorganic phosphate is present. The phosphate appears to activate the enzyme by destroying an amylopectin-protein complex, which presumably exists between the enzyme and covalently attached phosphate groups on the amylopectin. When the phosphate is removed by dialysis, reaggregation occurs. The disaggregation and

hydrolysis of waxy amylopectin at room temperature by an unknown enzyme resembles the disaggregation and random hydrolysis of amylopectin when the waxy amylopectin is subjected to acid conditions at 98° C. By autoclaving the kernels before dispersing the starch, not only is the unknown enzyme destroyed, but the aggregates of the amylopectin do not form if proper conditions are maintained. A consistent, extrapolated molecular weight of about 4 to 8 million is obtained for waxy corn amylopectin.

- 2200\* • **Radiochemical Studies on the Production of Starch in Plants. II. Application of Radioactive Data to the Glycogen Precursor and the Amylose Precursor Mechanisms**  
 STIG R., ERLANDER  
 Die Starke 19(4): 99-110. April 1967

Tracer techniques have been used in a study of the deposition of straight and branched components of starch. On a weight basis, the amount of radioactivity incorporated into amylose is greater than that incorporated into amylopectin during the first 2 or 3 days after injection of radioactive sucrose into the wheat plant. A statistical distribution is incorporated into the two components in succeeding days. In wheat endosperm, radioactive starch appears to be produced as long as 14 days after injection of radioactive sucrose. The radioactive content of amylose goes through a maximum during the first day after injection, followed by a sharp decline following the first afternoon period when sucrose content is

highest. During the first day the ratio of radioactive to nonradioactive glucose units is much greater for amylose than for amylopectin even though radioactive units are being incorporated into both components. The results suggest that glycogen must exist in the cell 3 or 4 days before it is converted to starch. If so, the initial high radioactivity in amylose is due to the incorporation of radioactive glucose to the exterior tiers of these molecules. Removal of the exterior radioactive branches from such precursor glycogen molecules and conversion of the removed branches into amylose produce greater radioactivity in amylose than in amylopectin.



**2201 • Soybean Protein Foods**

Proc. Conf., sponsored by U.S. Department of Agriculture, United Nations, and Soybean Council of America, Peoria, Ill., October 17-19, 1966.  
North. Util. Res. Develop. Div.  
U.S. Agr. Res. Serv., ARS-71-35, 285 pp. May 1967

Potentials are reviewed for soybean production and use as related to protein needs of the world. Nutritional and chemical studies on soy protein products are summarized. Current status of com-

mercially manufactured soy products are discussed. The marketing and distribution patterns of soybean protein products in various countries are discussed.

**2202 • Asymmetric Triglycerides from *Impatiens edgeworthii* Seed Oil**

M. O. BAGBY and C. R. SMITH, JR.  
Biochim. Biophys. Acta 137(3): 475-477. June 1967

*Impatiens edgeworthii* Hook f. seed oil, which contains acetate, parinarate, and the more common fatty acyl groups, was hydrogenated to give mainly  $\alpha$ -acetodistearin. The hydrogenated oil produced a plain negative optical rotatory dispersion curve.

Comparison of the dispersion curve with those of  $\alpha$ -acetodiacyl triglycerides synthesized by stereoselective methods indicates that the triglycerides of *Impatiens edgeworthii* seed oil have the (S)-configuration.

**2203 • Acetoxylation of Methyl Oleate with a Resin Catalyst**

L. T. BLACK and R. E. BEAL  
J. Amer. Oil Chem. Soc. 44(5): 310-312. May 1967

The reaction of methyl oleate with acetic acid in the presence of a reticulated cation exchange resin produces methyl acetoxystearate. Time, temperature, acetic acid:ester ratio, and resin:ester ratio were examined for their effects on yield of methyl acetoxystearate. A yield of approximately 45% of

theory was reached under the best conditions. Acetoxy esters were separated from unreacted methyl oleate and ester polymers by fractional distillation. Molecular weight and gas-liquid chromatographic data substantiate the product structure.

**2204 • Optically Active Trihydroxy Acids of *Chamaepeuce* Seed Oils**

K. L. MIKOLAJCZAK and C. R. SMITH, JR.  
Lipids 2(3): 261-265. May 1967

Two trihydroxy acids have been isolated from *Chamaepeuce afra* (Jacq.) DC. seed oil and identified as (+)-*threo*-9,10,18-trihydroxyoctadecanoic (phloionolic) acid (9%) and (+)-*threo*-9,10,18-trihydroxy-cis-12-octadecenoic acid (14%). The unsaturated acid has not previously been found in nature. Nuclear magnetic resonance, infrared, thin-layer chromatog-

raphy, optical rotation, and identification of the oxidative cleavage products show that these two trihydroxy components have the structures indicated. *Chamaepeuce hispanica* DC. seed oil and the seed oil of an unidentified *Chamaepeuce* species apparently contain these same two acids but in different proportions from *C. afra* oil.

- 2205 • Influence of Commercial Processing on Composition and Properties of Corn Zein**  
JOYCE A. BOUNDY, J. E. TURNER, J. S. WALL, and R. J. DIMLER  
Cereal Chem. 44(3): 281-287. May 1967

The chemical and physical properties of two commercial preparations of corn zein proteins were compared with those of zein prepared in the laboratory by direct extraction of the grain with 70% ethanol. The three zeins differed in content of sulfur amino acids, disulfide sulfur, and total sulfur and in their electrophoretic mobilities on starch gel. Evidently, commercial steeping of corn grain in sulfur

dioxide before milling cleaves disulfide bonds, thereby disrupting disulfide-linked intermolecular aggregates in native zeins. Sulfurous acid-treated zein may contain S-sulfocysteine residues, as indicated by high sulfur content and low electrophoretic mobility. A commercial zein subjected to alkaline treatment so as to render its solutions more stable had less cysteine and total sulfur than the native protein.

- 2206 • Bacterial and Actinomycete Flora of Kansas-Nebraska and Pacific Northwest Wheat and Wheat Flour**  
R. R. GRAVES, RUTH F. ROGERS, A. J. LYONS, JR., and C. W. HESSELTINE  
Cereal Chem. 44(3): 288-299. May 1967

Wheat and flour samples from 11 representative flour mills in the Kansas-Nebraska and Pacific Northwest wheat-producing areas were examined for their bacteriological content. Tests were made for total aerobic bacteria, psychrophiles, fecal streptococci, salmonellae, coagulase-positive staphylococci, catalase-negative bacteria, thermophilic spores, and actinomycetes. The standard method for estimating total aerobic bacteria was improved through the use of cycloheximide as a fungal inhibitor. In general, total

and differential counts were quite low. Counts for total bacteria ranged from 220 to 20,000 per gram in flour and from 15,000 to 660,000 in wheat. These counts were consistently lower in the finished flours than in the parent grains. Actinomycete counts ranged from 0 to 5,300 per gram of flour and from 0 to 300 per gram of wheat. Tests for salmonellae and coagulase-positive staphylococci were negative in the samples examined.

- 2207 • On-Machine Evaluation of Modified Wheat Flours as Surface Sizes for Paper**  
J. C. RANKIN, B. T. HOFREITER, W. A. CHILSON,<sup>1</sup> and D. J. FAHEY<sup>1</sup>  
(<sup>1</sup>USDA Forest Products Laboratory, Madison, Wis.)  
Tappi 50(6): 94A-96A. June 1967

The performance of acid-modified and hydroxyethylated acid-modified soft wheat flours in the surface sizing of paper was determined on an experimental fourdrinier machine. Strength and surface properties of papers sized with flour products were comparable to papers sized with a commercial hypochlorite-oxidized starch. Flour pastes had little ten-

dency to foam and were similar in viscosity behavior to a reference commercial starch paste. Although analyses showed some flour protein was not absorbed by the paper, the lack of total uptake of protein did not adversely affect the running characteristics of pastes or quality of sized paper during 2- to 3-hour runs.

**2208\* • Current Sorghum Research**

C. W. BLESSIN

Sorghum Newsletter 10: 23-24. June 1967

Research on grain sorghum at the Northern Utilization Research and Development Division continues in a number of areas of concern to sorghum investigators. Among them are the composition and

nutritional quality of sorghum grain proteins, phenolic pigments, and separation of some dry-milling fractions of the grain by water flotation.

**2209 • Effect of Phosphate Buffer on Dispersed Starch. I. Hydrolysis of Amylopectin at Various pH Values**

STIG R., ERLANDER and R. TOBIN

Die Starke 19(3): 73-78. March 1967

Waxy corn starch was dissolved at room temperature and neutral pH with a solvent system containing concentrated amounts of lithium bromide and guanidinium chloride. Light-scattering molecular weights on the waxy corn amylopectin showed that at pH 7 with sodium phosphate, mercuric iodide, and layered toluene, the amylopectin was hydrolyzed. Because no hydrolytic action occurred at pH 3.5 and pH10, the hydrolysis must be due to an enzyme, especially since no bacteria could be detected. The enzyme can be inactivated by shaking the starch granules in a 20% amyl alcohol-water mixture or by autoclaving the wet granules or dispersed amylopectin. Treatment of

dispersed aqueous amylopectin with hot amyl alcohol (Schock's method) also denatures the enzyme. Amylopectin autoclaved either after placing in a light-scattering cell or while still in the starch granules showed constant molecular weights as a function of time. The enzyme (or enzymes) is therefore not formed from bacteria during the isolation procedure but must be present in the kernel. Its hydrolytic action behaves like that of  $\alpha$ -amylase and not a normal phosphorylase. The phosphate may be involved in the enzyme mechanism or it may serve only to dissociate the enzyme from the carbohydrate.



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- 1985\* • **Soybean Lecithin. Production and Use of Phosphatides**  
 JOHN C. COWAN  
 Indus Times 6(219): 5. June 23, 1967

The original article appeared in the Proceedings  
 of the Regional Oil Conference, Sponsored by the

Soybean Council of America, Inc., in Tehran, Iran,  
 October 20-24, 1964.

## CONTRACT AND GRANT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with  
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 zation Research and Development Division.]

- 174-C • **Fluidized-Bed Characteristics of Wheat Flour**  
 EDGAR M. FRIED and THOMAS D. WHEELOCK  
 Iowa State University, Ames  
 Chem. Eng. Progr., Symp. Ser. 62(69): 114-122. 1966
- 175-C • **Viability of *Bacillus popilliae* After Lyophilization of Liquid Nitrogen Frozen Cells**  
 A. J. LINGG, K. J. McMAHON, and CHERYL HERZMANN  
 Kansas State University, Manhattan  
 Appl. Microbiol. 15(1): 163-165. January 1967
- 176-C • **Homogeneous Catalysis in the Reactions of Olefinic Substances. V. Hydrogenation of Soybean Oil Methyl Ester with Triphenylphosphine and Triphenylarsine Palladium Catalysts**  
 HIROSHI ITATANI and JOHN C. BAILAR, JR.  
 University of Illinois, Urbana  
 J. Amer. Oil Chem. Soc. 44(2): 147-151. February 1967

- 178-C • **Sorption of Ammonia by 'V' Amylose**  
P. C. NICOLSON, G. U. YUEN, and B. ZASLOW  
Arizona State University, Tempe  
Carbohyd. Res. 3(2): 168-176. December 1966
- 179-C • **Homogeneous Catalysis in the Reactions of Olefinic Substances. VI. Selective Hydrogenation of Methyl Linoleate and Isomerization of Methyl Oleate by Homogeneous Catalysis with Platinum Complexes Containing Triphenylphosphine, -arsine, or -stibine**  
JOHN C. BAILAR, JR. and HIROSHI ITATANI  
University of Illinois, Urbana  
J. Amer. Chem. Soc. 89(7): 1592-1599. March 1967
- 181-C • **Copolymerizations of Esters and Glycerides of Unsaturated C<sub>18</sub> Fatty Acids with Ethyl Acrylate and Acrylonitrile**  
FRANK R. MAYO and CONSTANCE WILLARD GOULD  
Stanford Research Institute, Menlo Park, Calif.  
J. Amer. Oil Chem. Soc. 44(3): 178-184. March 1967
- 183-C • **Homogeneous Catalysis in the Reactions of Olefinic Substances. VII. Hydrogenation and Isomerization of Methyl Linoleate with Bis(triphenylphosphine)-nickel Halides**  
HIROSHI ITATANI and JOHN C. BAILAR, JR.  
University of Illinois, Urbana  
J. Amer. Chem. Soc. 89(7): 1600-1602. March 1967
- 184-C\* • **Electron Transport in *Bacillus popilliae***  
ROLLIN E. PEPPER and RALPH N. COSTILOW  
Michigan State University, East Lansing  
J. Bacteriol. 89(2): 271-276. February 1965

[Report of research work done by an outside agency under a grant from the U.S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division.]

- 13-G • **Synthesis and Reactions of Unsaturated Sugars. IV. Methyl 4,6-O-Benzylidene- $\alpha$ -D-erythro-hex-2-enopyranoside and Its Hydrolysis by Acid**  
ESTER ALBANO, D. HORTON, and TSUTOMU TSUCHIYA  
The Ohio State University, Columbus  
Carbohyd. Res. 2(5): 349-362. September 1966
- 14-G • **Acid-Catalyzed Degradation of a 2,3-Unsaturated Sugar**  
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The Ohio State University, Columbus  
Carbohyd. Res. 3(2): 257-259. December 1966
- 15-G • **Dimethylthiocarbamates of Sugars**  
D. HORTON and H. S. PRIHAR  
The Ohio State University, Columbus  
Carbohyd. Res. 4(2): 115-125. April 1967



[Report of research work supported with funds provided by the U.S. Department of Agriculture under the authority of U.S. Public Law 480, 83rd Congress, and sponsored by the Northern Utilization Research and Development Division.]

- 138-F • Structure of the Cell Wall of *Micrococcus lysodeikticus*. I. Study of the Structure of the Glycan**  
 MÉLINA LEYH-BOUILLE, JEAN-MARIE GHUYSEN, DONALD J. TIPPER, and JACK L. STROMINGER  
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 EMILIO MUÑOZ, JEAN-MARIE GHUYSEN, MÉLINA LEYH-BOUILLE, JEAN-FRANÇOIS PETIT, and REGINA TINELLI  
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- 140-F • Studies on Starches of High Amylose-Content. Part VII. Observations on the Potentiometric Iodine-Titration of Amylomaize Starch**  
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- 141-F • The Thermal Degradation of Starch. Part 6. The Pyrolysis of Amylomaize Starch in the Presence of Inorganic Salts**  
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 In "Applied Polymer Symposium, No. 2, Thermoanalysis of Fibers and Fiber-Forming Polymers," ed. R. F. Schwenker, Jr., pp. 159-173. New York. 1966
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**143-F • Some Reactions of Unsaturated Fatty Acids and Their Derivatives in Molten Alkalies**

M. F. ANSELL, A. N. RADZIWILL, D. J. REDSHAW, I. S. SHEPHERD,  
D. WALLACE, and B. C. L. WEEDON  
Queen Mary College, London, England  
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**144-F • Polysaccharides of Soy-beans. Part II. Fractionation of Hull Cell-wall Polysaccharides and the Structure of a Xylan**

G. O. ASPINALL, K. HUNT, and I. M. MORRISON  
University of Edinburgh, Edinburgh, Scotland  
J. Chem. Soc., Sec. C(21): 1945-1949. 1966

**145-F • Species of *Mucor* from India. I**

BRIJ RANI MEHROTRA, USHA BAIJAL, and B. S. MEHROTRA  
University of Allahabad, Allahabad, India  
Sydowia, Ann. Mycol. Ser. II. 19(1-6): 238-243. June 1965

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USHA BAIJAL and B. S. MEHROTRA  
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Sydowia, Ann. Mycol. Ser. II. 19(1-6): 204-212. June 1965

**147-F • Species of *Syncephalis* from India. I**

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RAJESHWAR PRASAD  
University of Allahabad, Allahabad, India  
Mycopathol. Mycol. Appl. 29(3-4): 207-210. August 1966

**149-F • The Peptide Subunit  $N^{\alpha}$ -(L-Alanyl-D-isoglutaminyl)-L-lysyl-D-alanine in Cell Wall Peptidoglycans of *Staphylococcus aureus* Strain Copenhagen, *Micrococcus roseus* R 27, and *Streptococcus pyogenes* Group A, Type 14**

EMILIO MUÑOZ, JEAN-MARIE GHUYSEN, MÉLINA LEYH-BOUILLE,  
JEAN-FRANCOIS PETIT, HANS HEYMAN, EVANGELOS BRICAS  
and PIERRE LEFRANCIER  
University of Liège, Liège, Belgium  
Biochemistry 5(12): 3748-3764. December 1966

- 150-F • Studies on Dextran and Dextran Derivatives. XI. Sedimentation of Mixtures of Dextrans of Different Molecular Weights**  
E. CHIANCONE  
University of Rome, Rome, Italy  
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- 151-F • Subaleurone Endosperm Cells of High Protein Content**  
N. L. KENT  
Research Association of British Flour-Millers, St. Albans, Herts., England  
Cereal Chem. 43(5): 585-601. September 1966
- 152-F • Obtaining High-Protein Fractions by Pearling Grain**  
C. R. JONES and N. L. KENT  
Research Association of British Flour-Millers, St. Albans, Herts., England  
Milling 145(9): 183. August 1965
- 153-F • Endosperm Reduction in Hard Red Spring Wheat**  
N. L. KENT and A. D. EVERS  
Research Association of British Flour-Millers, St. Albans, Herts., England  
Northwest. Miller 273(12): 12, 14, 16, 18, 20-22. December 1966
- 154-F • Enzymic Methods for the Microdetermination of Glycogen and Amylopectin, and Their Unit-Chain Lengths**  
E. Y. C. LEE and W. J. WHELAN  
Royal Free Hospital School of Medicine, London, England  
Arch. Biochem. Biophys. 116(1-3): 162-167. September 1966
- 155-F • Enzymic Assay of the Average Length of the Unit-Chain of Amylopectin**  
G. K. ADKINS, W. BANKS, and C. T. GREENWOOD  
University of Edinburgh, Edinburgh, Scotland  
Carbohydr. Res. 2(6): 502-503. October 1966
- 156-F • Polysaccharide Components of Soybeans**  
G. O. ASPINALL, R. BEGBIE, and J. E. McKAY  
University of Edinburgh, Edinburgh, Scotland  
Cereal Sci. Today 12(6): 223, 226-228, 260-261. June 1967



January — June 1967



## PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased (50 cents each) from the Commissioner of Patents, U.S. Patent Office, Washington, D.C. 20231. Order by number, do not send stamps.]

**Gas-Solid Chromatography Using Column Comprising  $\text{AgNO}_3$ -Coated Alumina**

RICHARD L. HOFFMANN

U.S. Patent 3,298,160. January 17, 1967

Unsaturated hydrocarbon contaminants contained in carrier and combustion sources for gas-solid chromatography and in paraffinic materials to be analyzed by subtractive gas-solid chromatography

are selectively removed by transit through an alumina column in which a short initial portion thereof has adsorbed thereon about 18 to 22% of light-protected silver nitrate.

**Process for Obtaining Amyloglucosidase**

KARL L. SMILEY

U.S. Patent 3,301,768. January 31, 1967

Amyloglucosidase potencies of 12 to 18 units per milliliter of culture filtrate essentially free of associated transglucosidase are obtained by fermenting *Aspergillus awamori* NRRL 3112 for about 4 days at

35° C. in an acidified 20% corn meal medium that has been partially hydrolyzed by malt enzymes before sterilization and inoculation. The fermentation requires about 1.5 v./v./m. of air and rapid stirring.

**Polyhydric Phenol-Modified Fatty Media and Iron Surfaces Chelated Therewith**

RAYMOND NOEL FAULKNER and LEONARD ALFRED O'NEILL

U.S. Patent 3,304,276. February 14, 1967

Glycol ether solutions of novel metal-reactive primer coatings comprising galatte, tannate, or pyrogallol-modified vegetable oils, esters, and oil-modified alkyds react *in situ* with unoxidized iron and

steel surfaces to form novel organometallic complexes that migrate from the interface into the coating and cure it to provide durable films containing residual phenol groups.

### Solvent and Process for Obtaining Undepolymerized Amyloses

STIG R. ERLANDER and ROBERT TOBIN

U.S. Patent 3,306,772. February 28, 1967

A new solvent solution dissolves starches, including 70% amylose starch, at room temperature without depolymerizing the amylose. Nearly quantitative yields of amyloses having uniquely high molecular weights are precipitated by adding enough absolute ethanol to a 5 *M* lithium thiocyanate-2.5 *M* guanidinium thiocyanate solvent solution to form a 23% by weight ethanolic solution. The heterogeneity that

results on adding the ethanol is overcome by briefly warming to about 45° C. A partially purified amylose is centrifuged down when the ethanolic solution returns to room temperature. The pure undepolymerized amylose having an extremely high molecular weight is then obtained by complexing with a mixture of amyl alcohols.

### Process of Making Spore-Containing Cultures of Japanese Beetle Milky Disease Bacteria

ROBERT A. RHODES, GEORGE R. HRUBANT, and MARGARET SHEKLETON ROTH

U.S. Patent 3,308,038. March 7, 1967

Appreciable extents of *in vitro* formation of Japanese beetle milky disease bacterial spores are reproducibly obtained by a process in which 0.3-ml. portions of a 10<sup>7</sup> dilution of a late log-phase vegetative cell inoculum of *Bacillus popilliae* sub-strain NRRL B-2309L or *B. popilliae* B-2309S from a 16- to 24-hour aerobic fermentation of a said bacillus in a distilled water medium containing as separately autoclaved constituents 1.5% yeast extract, 0.3% K<sub>2</sub>HPO<sub>4</sub>, and 0.2% glucose are sparingly plated on replicated plates of a carbohydrate-free solid medium prepared by adding as separately autoclaved components from 0.10 to 0.150% K<sub>2</sub>HPO<sub>4</sub>

and 0.035 to 0.070% CH<sub>3</sub>COONa to an autoclaved solution of distilled water containing 1.5% of yeast extract and 2.0% of agar granules that have been exhaustively washed with deionized water, overlaying the inoculated plates with 5 ml. of a 1% solution of similarly washed agar, incubating the overlayed plates at 30° C. for 42 days to induce growth of not more than about 30 widely spaced colonies, and then heating the plates at 50° C. for 15 minutes to kill only the vegetative cells, thereby leaving as viable cells only the 3 to 5% content of sporulated cells.

### Flotation Separation of Dry Milled Cereal Grain Components

LAURENCE A. WEINECKE and RONALD R. MONTGOMERY

U.S. Patent 3,312,341. April 4, 1967

Greatly improved separations of dry milled corn or sorghum into germs and endosperms are obtained in a water flotation column wherein the mixture to be separated is fed at the midpoint of the column and wherein the water moves upward from a lowly placed inlet at the critical rate of about 5.5 f.p.m. for the milled corn and about 3.8 f.p.m. for

the sorghum. Successively recycling the obtained endosperms in critically accelerated columns of water separates the grits into a more buoyant fraction containing more attached germ and a less buoyant fraction containing a smaller amount of germ and intrinsic oil.

## **Picrate Process for Determining Quaternary Ammonium Content of Microbial Polysaccharides**

JAMES H. SLONEKER

U.S. Patent 3,314,764. April 18, 1967

The residual quaternary ammonium ion contents of microbial polysaccharides that have been precipitated from their fermentation media in the form of a quaternary ammonium complex are found by a process comprising hydrolyzing a viscous solution of the polysaccharide with 3 *N* phosphoric acid, adding 3 *N* sodium hydroxide to provide a pH of not less than 3.0, adding half-saturated picric acid solution to

form the insoluble picrate salt of the quaternary ammonium cation, selectively extracting the picrate salt with successive portions of chloroform, bringing the pooled extracts up to volume, and obtaining the photometric absorbance value at a wavelength of 365 m $\mu$  for comparison with the values of a standard curve.

## **Microbial Polysaccharide and Process**

MARTIN C. CADMUS and RALPH F. ANDERSON

U.S. Patent 3,314,801. April 18, 1967

A twentyfold increase in the viscosity of a 1% aqueous solution of the galactose-containing purified polysaccharide precipitated from an aerobic fermenta-

tion of *Arthrobacter viscosus* NRRL B-1973 or NRRL B-1797 is obtained by adding to said aqueous solution from 0.25 to 0.5% of aluminum sulfate.

## **Hexose Polythiomercaptal Adhesives**

ARCHIE J. DEUTSCHMAN, JR., and JAMES W. BERRY

U.S. Patent 3,314,913. April 18, 1967

Novel linear hexose dimercaptal polymers obtained by neutralizing a low temperature polymerization of a hexose and a C<sub>5</sub>-C<sub>10</sub> dithiol, such as 1,5-pentanedithiol or 1,10-decanedithiol, in the presence of a strong halogen acid catalyst, optimally a 27% solution of hydrofluoric acid in dioxane, cure to

insoluble, high-strength resins when dimethyl sulfide solutions thereof are acidified. Even when amateurishly applied as excessively thick layers for joining blocks of wood, the wood will rupture, leaving the layer of crosslinked sugar polythioacetal resin intact.

## **Iron Butoxide Improved Polyhydric Phenol Modified Alkyd Compositions**

RAYMOND NOEL FAULKNER and LEONARD ALFRED O'NEILL

U.S. Patent 3,321,320. May 23, 1967

Alkyd primer coatings for steel exhibit improved cure and resistance to corrosion when a small amount of iron butoxide is incorporated in ethylene glycol

monoethyl ether or mixed ethylene glycol monoethyl ether/naptha solutions of the alkyd before application to a clean steel surface.



## Process for Obtaining Pure Methyl Azelaaldehydate from Ozonolysis of Commercial Methyl Oleate

WILLIAM R. MILLER and DANNY JOE MOORE

U.S. Patent 3,322,798. May 30, 1967

The large number of products formed when commercial methyl oleate is subjected to ozonization and reduction makes it impossible to obtain pure methyl azelaaldehydate therefrom by mere distillation. Extremely pure methyl azelaaldehydate can be obtained after ozonizing and reducing commercial methyl oleate by removing the fraction distilling at 28° to 94° C./3 mm., subjecting the fraction boiling

at 65° to 118° C./0.5 mm. to bisulfite complex formation, removing contaminants from the crystals of the complex with an organic solvent, regenerating the methyl azelaaldehydate from the complex with aqueous alkali, extracting with ether, flashing off the ether, and isolating the methyl azelaaldehydate fraction boiling at 85° to 86° C./0.2 mm.

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